APPLICATIONS OF RESONANCE

The ELECTRICAL REVIEW

FOUNDED 1872

OL. CXII
O. 2900

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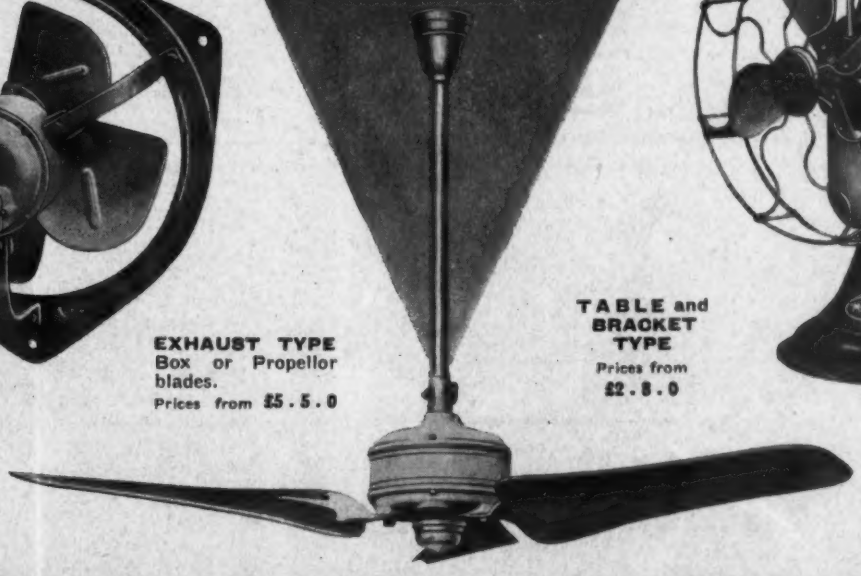

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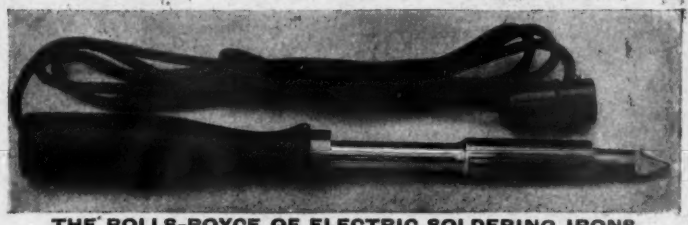

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The
Electrical Review

VOL. CXII. JUNE 23, 1933. No. 2900.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Truth About Cooking

THE discussion that followed the reading of the I.M.E.A. paper on "Electric Cooking" by Messrs. P. J. Robinson and E. E. Hoadley was of more immediately practical importance than any we have heard for many conventions. It was not that the paper contained much that was novel (although the authors' conclusions regarding meat shrinkage caused something of a sensation), but it brought us right down to "brass tacks" by presenting in a clear and concise manner the known facts supported by data derived from first-hand experience. It thus provided a focusing point for the views of those who have laboured in the same field and who seriously do mean business.

Controversy naturally arose about the boiling plate. Our objections to raising the loading are not so much due to the difficulty of simmering that this would entail; that is difficult enough now, and if the higher loading compelled some modification in design it would not be a bad thing. But we do question its advisability having regard to voltage variations (whether officially permitted or no) and the manufacturers' tolerances necessary to meet slightly differing declared voltages throughout the country.

Reliability must not be sacrificed to speed. And is high loading so important as the education of the consumer to use really flat-bottomed utensils or to appreciate that what is invisible and silent in operation may be fulfilling its function speedily and efficiently? Because of this absence of fuss there is always the risk of the cooker being left in circuit when not in use, and it was disappointing to learn that pilot lamps are so often unsatisfactory, as we would not be without one.

That considerably less than half a million cookers are in service when they have everything in their favour lends weight to the view that there are still many engineers who are "supremely indifferent" to electric cooking or who "shun it like the plague," though we would date the appearance of the modern cooker at five instead of ten years ago, as one speaker suggested.

The bulk of the cooking load is to be obtained in the homes of those who cannot afford to buy or hire-purchase expensive apparatus or to meet large accounts. The West Ham "penny-in-the-slot penny-a-unit" tariff, inclusive of cooker hire as well as lighting, seems to us a courageous attempt to meet the conditions. That it is unscientific is not necessarily a condemnation of its practical utility, so long as what may be lost on the swings is gained on the roundabouts; its appeal to the consumer is obvious, and its basis is, after all, that on which most commodities are sold.

While we should like to see settled beyond all doubt the question of meat shrinkage, and also whether any poisons from gas are absorbed by food, we regard it as of far greater moment that, on the proven facts, electricity at reasonable tariffs is cheaper, as well as better, for cooking than gas.

Callender's

LAST week, after the annual meeting of Callender's Cable Company, the prominent associates of Sir Tom Callender presented this grand old man of the cable industry with a portrait of himself in oils by Van Jones as a token of their esteem and to further mark the jubilee of the company, which was celebrated last year. In the course of the speeches at the annual meeting reference was made to the new high-voltage cable department which has been added at Erith to meet the present demand and the larger business that is anticipated for this class of cable. The research department at Wood

Lane, which will be completed shortly, will be equipped with research and testing equipment for all classes of cables up to a pressure of 1,000,000 V. Sir J. Fortescue Flannery claimed that this would be one of the best, if not the best, cable manufacturing research laboratories in the world. It was satisfactory to hear from both the chairman and Sir Tom Callender that the order book shows improvement, and that the trade outlook is better, though optimism is toned down by exceptionally keen competition and resulting low prices. The largest part of the company's profit is derived from home orders, but its overseas operations, in which Sir Tom for many years took so large a hand, continue to be of great importance. Very appropriately, therefore, Sir Malcolm Fraser gave an impressive review of the very extensive part that Callender's have played in the electrification of India.

General Electric Results

WITH the works on the whole fully employed and output at a satisfactory level, the General Electric Company is able to show profits of £1,012,739 for the year ended March, 1933, a decrease of £44,918 on the year, and the 8 per cent. ordinary dividend is maintained. The number of employés, however, is less by 1,482; diminution of industrial electrification orders affected the heavy engineering department. Future statements will show the benefit of the reduction of debenture interest from 5 to 4¼ per cent., while the range of the company's products is so wide and its home and overseas organisation is so extensive that revival, if it is coming, as it appears to be, should benefit most departments before long.

The World Power Conference

THE Sectional Meeting of the World Power Conference begins on Monday next at Copenhagen, but the technical sessions will not open before Thursday, when several papers of live interest to our readers will be presented at Stockholm, including some on energy problems in large industries and in city and suburban traffic. The contribution to which we look forward most eagerly (out of the total of 213) is one entitled "A Survey of Industrial Electric Power Supply in Great Britain," which is being submitted by the Central Electricity Board, the I.M.E.A., and the Incorporated Association of Electric Power Companies, the authors being Messrs. H. Hobson, F. Forrest, and C. D. Taite. If its theme is what its title suggests to us, it should lay down the broad lines upon which a power canvass of the country could be undertaken, as we have so often advocated.

A Paris Meeting

THE biennial E.H.P. Conference in Paris this week is sandwiched between the most important British summer meeting—the I.M.E.A. Convention—and the World Power Conference in Scandinavia, by which, as an international congress, the Paris meeting is somewhat overshadowed. It is, perhaps, too much to expect of busy engineers that in addition to the preparation of papers regarding the most recent technical developments they should hurry from one Continental capital to another without a break. The trend of electrical development in our own country is indicated by the titles of the British papers (reported in our last issue), which deal with problems of transmission and distribution.

The O.L.A. in Somerset

THE opportunity which the annual summer tour of the Overhead Lines Association afforded of seeing something of the very remarkable progress made in the rural distribution of electricity in North Somerset amply justified the cross-country dash from I.M.E.A. activities at Bournemouth which it involved. Almost every mile of the 70-mile route traversed brought fresh aspects of the North Somerset Co.'s work into view, amply demonstrating the company's initiative in overcoming convention and difficulties. Soundness of design, shorn of all avoidable elaboration of detail, and coupled closely with intensive load building, are the keynotes of success, backed by effective demonstrative propaganda and really adequate showroom and sales service to consumers. The layout of the distribution system is such as to provide every village with at least two routes of supply, and the diverse nature of the power load which preponderates in this rural area is evidence of the effort which is being exerted to offer universal service.

Lightning Strokes

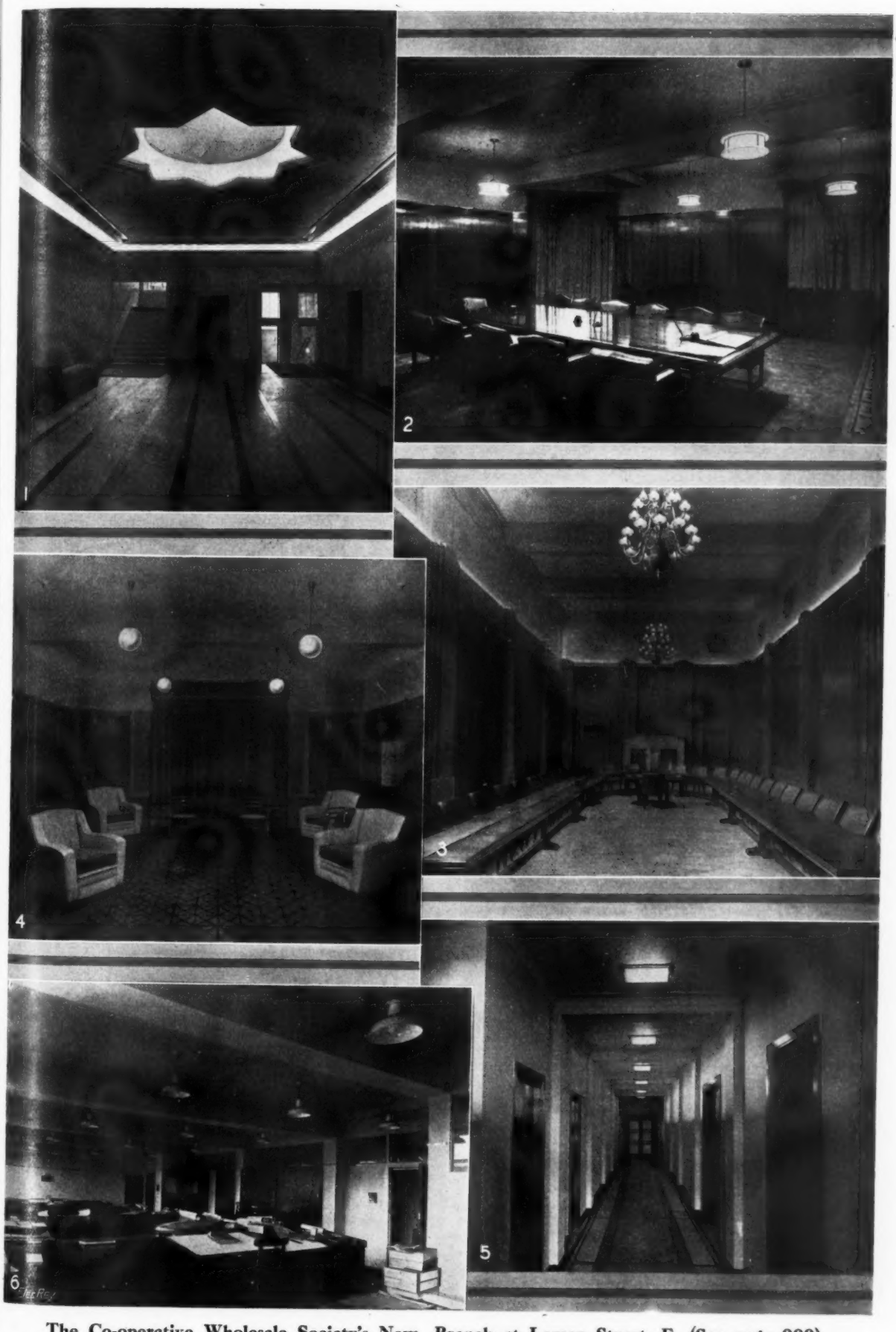
THREE deaths were caused by lightning in the London area during last Monday's storm. It is doubtful whether any being can escape alive from a direct stroke, recorded cases of survival being probably due to most of the energy having been expended elsewhere. This is not surprising when one considers that the energy dissipated by a flash may amount to as much as a million kW (10^9 watt-seconds per flash) and that the potential difference at the beginning of a mile discharge may be 5×10^6 V, while estimates of the current give upwards of 100,000 A. Flashes are usually made up of a sequence of steep-fronted discharges with an individual duration of less than .00003 sec., an ordinary rate of current increase being 7×10^9 A per sec. Effects due to electrostatic or electromagnetic induction (the former is much the more important) may also be serious, principally due to consequential fires; induced potentials of nearly 5,000 V per ft. have been observed as a result of flashes three miles away. First-aid treatment for lightning injuries is the same as that for electric shocks and burns; artificial respiration administered immediately would probably prevent many of the deaths which occur from lightning.

A New P.F. Burner

THE chief difficulty of adapting pulverised fuel firing systems to small boilers has been the large furnace space required to ensure complete combustion. With mechanical stokers a speeding up of the process can be effected by increasing the draught, but with pulverised fuel owing to the smallness of the particles, increasing air speed or turbulence merely results in a similar change in their motion. The "grid" burner developed by the Fuel Research Board (Technical Paper No. 36. Stationery Office, 6d.) is so designed that the mixture of fuel and primary air issues in thin layers from narrow slots, between which are the secondary air slots. Cold tertiary air is admitted round the periphery of the combustion chamber front. The design of the grid burner is claimed to be far enough advanced to be applied even to Lancashire boilers using coal with as little as 21 per cent. volatile matter. It is said to be cheap to construct; we see no reason why it should not be reliable and easy to operate.

Lights and Bushels

ONE by one electricity supply authorities are arriving at a fuller appreciation of the virtue and necessity of publicity for their service. The London and Home Counties Joint Electricity Authority is a body which, so far, has not had a very good Press. It has been the subject of ignorant attacks to which it has been unable to reply effectively, but this week the "dailies" made some amends by giving fairly good reports of the luncheon to Mr. W. F. Marchant, the retiring chairman of the Authority. There is no doubt that the Authority is doing some good work, which has already produced tangible results in the shape of lower prices and better service, and it is only right that the public should know about it. We hope that the Authority will not fail to take advantage of every opportunity that offers to blow its own trumpet.



The Co-operative Wholesale Society's New Branch at Leman Street, E. (See page 900)

1. The entrance hall. 2. One of the committee rooms. 3. The board room. 4. The directors' writing room. 5. An example of corridor lighting. 6. The engineer's drawing office.

Applications of Resonance. By G. W. Preston, A.M.I.E.E.

IN many respects resonance is a unique phenomenon, and one for which there is probably a much wider field of application than has hitherto been explored. Resonant circuits often exhibit unusual and most surprising characteristics which at first sight appear to be contrary to fundamental principles.

A circuit is said to have resonance when it contains inductance and capacitance, and if at a given frequency the inductive and capacitive reactances are equal (*i.e.*, when $2\pi fL=1/2\pi fC$) the circuit is said to be in resonance.

When inductance and capacitance are connected in series the circuit has voltage resonance; that is to say, as the applied voltage is raised and the resonant condition is approached the current increases slowly until at a critical voltage the point of resonance is reached when it rises rapidly to a maximum value, which is limited only by the resistance in the circuit. Under these conditions the circuit becomes non-reactive, and

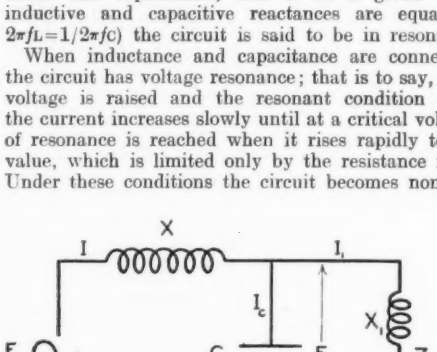


Fig. 1

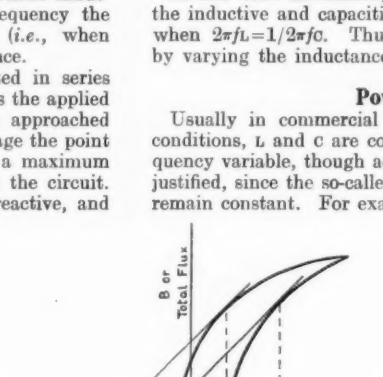


Fig. 2

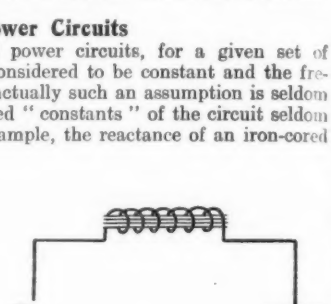


Fig. 3

what might be considered as the unnaturally heavy current which then flows may produce voltages across the inductance and capacitance many times greater than the applied voltage.

If capacitance and inductance are connected in parallel the circuit has current resonance when the value of the two reactances becomes equal. The action is exactly opposite to that in the series circuit, and if the circuit could have no resistance or dielectric loss its impedance would become infinite and no current would flow from the external source of e.m.f. The circuit, once charged, would oscillate within itself, the current flowing backwards and forwards between the inductance and capacitance. If resistance is present, heat is dissipated and the current has to be made up from the external source.

Resistance in general tends to flatten out the resonance curve of a circuit, since it limits the maximum value of the current in the series circuit and the minimum in the parallel circuit.

Method of Use

A resonant series circuit can be utilised as a means of producing a constant current from a constant source of e.m.f., and this arrangement was used in connection with some of the earliest lighting systems in which lamps were connected in series. It has recently been reintroduced in a slightly modified form in connection with the most modern form of illumination, the gaseous tube, employing a type of resonant auto-transformer circuit for the purpose of voltage transformation.

If a series circuit containing inductance and capacitance (fig. 1) is adjusted to resonance it has the curious characteristic that, so long as the voltage applied to it is constant, the current in any circuit, no matter what its impedance may be, which is connected in parallel with either the capacitance or the inductance will be constant and entirely independent of the impedance of the circuit. Since the current I in the resonating inductance equals the vector sum of the currents I_c through the condenser and I_1 through the external circuit of impedance $Z=R_1+jX_1$.

Therefore $I=I_c+I$ and $E=E_1+jXI$, where E_1 is the voltage applied to each of the parallel branches of the circuit.

Thus when $X_c=X$ and the series circuit is in resonance, the current in the external circuit $I_1=E/jX$, the absolute value of which it is evident is independent of the value of the impedance Z of the external circuit.

In practice it is not possible to design the circuit so that the current in the external circuit remains absolutely constant, but a close approximation can be achieved. The value of the supply current I is dependent on the impedance of the parallel or secondary load circuit and the greater its inductive reactance X_1 the lower I becomes for a fixed resistance R_1, and the higher the power factor, which approaches unity when $X=X_1$.

The current I_1 in the external circuit is displaced in phase from the supply voltage E and in the case shown in fig. 1 it would lag 90 deg. behind E when the power factor of the series circuit became unity.

By suitable design the circuit can be given various characteristics. For instance, the power factor of the series circuit can be made equal to that of the secondary circuit, or the latter circuit may be connected across the inductance instead of the capacitance, when I_1, while still remaining constant with a constant applied voltage E, will in general lead instead of lag behind E as in the previous case.

As has been mentioned, resonance occurs in a circuit when the inductive and capacitive reactances become equal; that is, when $2\pi fL=1/2\pi fC$. Thus it may be adjusted to resonance by varying the inductance, the capacitance, or the frequency.

Power Circuits

Usually in commercial power circuits, for a given set of conditions, L and C are considered to be constant and the frequency variable, though actually such an assumption is seldom justified, since the so-called "constants" of the circuit seldom remain constant. For example, the reactance of an iron-cored inductance is dependent, among other things, upon the permeability of the core iron, which, in turn, depends upon the flux density in it, and, with a fixed number of turns, upon the current flowing in the exciting winding.

With an applied alternating e.m.f. of constant frequency the inductance of a circuit containing magnetised iron is therefore not a constant and may vary within wide limits, especially when the iron approaches saturation. Thus the presence of an iron-cored inductance in a circuit introduces a dependent variable capable of producing resonance without any change of frequency.

A typical B/H curve for iron (fig. 2) indicates the relation between the magnitude of the magnetic flux established in the iron and the magnetomotive force producing it, or, with a fixed number of turns, the value of the exciting current.

In a circuit with fixed geometrical characteristics the magnetic flux established per ampère of exciting current is a measure of the circuit inductance. If therefore the inductance remains constant and is independent of the current, the flux/current curve is a straight line inclined at an angle to the current axis, and the slope of the line, as measured by the tangent of the angle, is also a measure of the inductance.

If the circuit be an iron-cored reactor, the B/H curves for the iron in the core being similar to those shown in fig. 2, the

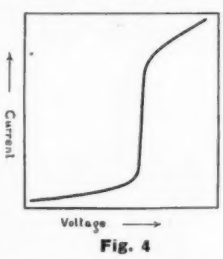


Fig. 4

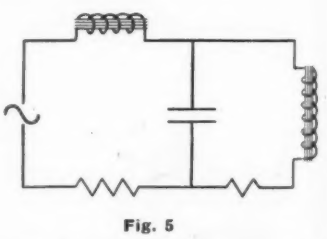


Fig. 5

flux per ampère, and therefore the inductance as measured by the slope of the curves, varies considerably at different portions of the cycle. A tangent drawn at any point is a measure of the slope of the curve and is therefore also an approximate measure of what is sometimes termed the "incremental inductance" of the reactor at that point.

If the reactor forms part of a circuit which will be caused to resonate when the inductance has a value represented by tan α (fig. 2) two tangents having the required slope may be drawn, one to each of the curves. Thus at two points during each half cycle, when the increasing current has a value i_1 and the decreasing current a value i_2 the conditions for resonance may be satisfied.

Since, therefore, resonance may occur only at specific values of exciting current it is possible for a circuit containing magnetised iron to have partial resonance which takes place during certain portions of a cycle only. Such a phenomenon may result in a complete distortion of the current wave form and the appearance of large peaks at the points of resonance.

Owing to the variation of the permeability of iron with flux density the effective inductance of an iron-cored reactor is a very variable quantity, since not only does it depend upon the shape of the B/H curves for the iron also, except at very high flux densities, it is a discontinuous function changing rapidly at each reversal of the excitation.

The effective a.c. inductance of a reactor is usually considered as the average value of the incremental inductances. That is to say, it is proportional to the average slope of the two B/H curves and, owing to their change of shape with increasing flux density, it will rise to a maximum value at medium densities and will fall away rapidly when saturation occurs.

Therefore the introduction of a reactor having an iron core capable of saturation must have a very marked effect upon the resonance characteristics of a circuit. Often the characteristics of such circuits are not only very unusual, but, as recent investigations have shown, they may also be capable of important commercial applications.

If a gradually increasing e.m.f. of sinusoidal wave form is applied to a simple series circuit of suitable design (fig. 3) the current in the circuit will increase gradually as the voltage is raised until the saturation point of the iron core in the reactor is approached. The inductance then falls rapidly, partial resonance occurs, and the current is suddenly increased.

The circuit may therefore have a volt-ampère characteristic of the type shown in fig. 4 which is similar to that of a sensitive relay, since at a critical voltage there is a very large increase of current for a very small increase of applied voltage.

Relays employing this principle have been developed recently and they may have considerable advantages, since they are purely electrical in operation.

The remarkable sensitivity of this type of resonant circuit to small changes in applied voltage makes it possible to devise a simple and effective system by means of which numerous separate operations may be remotely controlled only by variations of applied voltage transmitted over a single communication circuit.

In such a circuit as that shown in fig. 3 variations of frequency have some effect on the critical point at which the sudden increase of current takes place, but the change of effective inductance at this point is usually so large that small variations of capacitance and resistance have very little effect, although the value of the latter controls the point at which the current falls again rapidly as the voltage is reduced.

The transformation from constant voltage to constant current and *vice versa* by means of resonant circuits, the constants of which are assumed to be independent of voltage and current, has been known for a long time, but it is not so well known that by the introduction of variable circuit " constants," such as inductance in the form of iron-cored reactors, it is also possible to obtain some degree of variable voltage to constant current and variable current to constant voltage transformation.

It is very difficult, in fact, to place any limit on the nature of the circuit characteristics which it may be possible to obtain; for instance, circuits can be designed to give an almost infinite variety of volt-ampère charactistics, many of which should prove capable of useful adaption to commercial purposes.

One particularly interesting circuit is of the type shown in fig. 5, which can be designed to have a falling volt-ampère curve over a comparatively wide range of applied voltage. That is to say, the current in the circuit decreases as the applied voltage increases.

It is due to the fact that the circuit is so designed that as the applied voltage is increased the series reactor saturates, and with the occurrence of resonance the voltage across the condenser rises. The reactor in the parallel circuit then saturates and resonance in this circuit causes a rise of its impedance and results in the desaturation of the series reactor and a decrease of the primary current.

In such circuits as have been described it is inevitable that there should be some generation of harmonics and distortion of wave forms, together with variation of phase displacements between voltages and currents, but both of these factors may be controlled to some extent by suitable design.

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The Protection of Electric Motors. By D. D. Rayner, A.M.I.E.E.

The requirements of modern conditions

UNDER modern conditions the large amount of power behind a fault makes it desirable to protect electrical equipment from the disastrous effects of a short-circuit before the normal overload trips have time to operate. Protection against a failure of supply or an undue reduction in pressure is provided by the usual no-volt release, or the operating coil in the case of contactor gear, and there does not appear to have been any change in the principle of design of this feature since it was first incorporated in starters. On the other hand, overload protection has at different times been provided in the three following principal forms: (1) fuses; (2) thermal devices; and (3) solenoid or magnetic-type trips.

Fuses were early found to be unsuitable because the wire oxidises and deteriorates rapidly if run for any length of time at high temperatures, and it is therefore not practicable to use fuses which function at overloads of less than 50 per cent. It would therefore be possible for a motor to operate near this overload for a considerable time before it was noticed, by which time the maximum kVA might have been registered.

Mr. D. Dyson Rayner, A.M.I.E.E., Assoc.A.I.E.E.

Thermal Overload Releases

Thermal devices have been employed for a considerable time, but it is only within recent years that they have been offered in anything like a general sense in this country. There are two principle types available, one depending upon the expansion of a bi-metallic strip heated by the current passing through it, and the other utilising a small heating coil or strip which acts on a special solder element having a low melting point. Designs vary in detail, but the principle is the same. It might appear at first sight that the thermal overload trip would solve all overload troubles, but it possesses several drawbacks, the chief of which is that it is not applicable to all conditions of service. Thermal trips will provide adequate protection only for small motors, or for large ones carrying a fairly steady load over long periods with infrequent starting periods.

Two arguments are usually put forward by advocates of the thermal trip: first, that it is closely allied to the temperature rise of the motor; and, secondly, that it is cheaper than any other form of overload protection. The latter point, however, is of little value, as nothing is cheap if it does not function usefully. With regard to the first point, much will depend upon the rating and type of motor in addition to other factors, and it is difficult to see how the calibration can be adjusted to suit the variety of conditions.

Thermal trips are designed for hand re-setting, and the element must be allowed to cool before a re-set can be made. Further, as the time-lag feature is inherent, there is no protection against an abnormal flow of current; consequently, it is usual to incorporate fuses in the starter to provide protection against such faults. These may be of the high rupturing capacity cartridge type capable of dealing with 25,000 kVA, which afford an additional safeguard. If properly applied in a sound and well constructed design, the thermal principle can give the overload protection required, within the limitations already mentioned. So few of the designs on the market at the present time meet even the limited requirements satisfactorily, that it is advisable to examine and test a particular design thoroughly before acceptance for any specific installation.

Adjustability of the Solenoid Type

Magnetic or solenoid-type overload trips, particularly those with an iron plunger fitted with a dashpot retarding type time lag, are the simplest and most reliable form of motor overload protection devices. They are adjustable from full load upwards without skilled attention, and open the circuit-breaker with unfailing accuracy. They do not attempt to follow the temperature rise of the motor, which is better than an unsatisfactory attempt in this direction.

Bearing in mind that electric motors designed to comply with British Standards Specification will withstand 25 per cent. overload for only 15 minutes if under 4 h.p., 30 minutes if of 4 to 10 h.p., or 2 hours if over 10 h.p., it is essential that an overload trip, of whatever type and design, should be capable of adjustment and act in a reliable manner at less than 25 per cent. overload. The time lag feature is probably the most important and vital part of an overload trip for achieving satisfactory operation. The solenoid-type overload trip can be arranged for self re-set, hand re-set, or remote electrical re-set; in this respect it is more flexible and adaptable to all applications than those of the thermal type.

The practice of control gear makers in the past has been to provide two overload trips on starters operating on three-phase supplies with an insulated neutral and three trips if the neutral is earthed. It would appear desirable for all motor starters to be supplied complete with three overload trips irrespective of whether the system has the neutral insulated or earthed, particularly as the extra price involved is negligible in comparison with the total price. This would tend towards uniformity in specifications and eliminate one of the many trivial points which is always a source of irritation to the non-technical buyer, and the gear could be used with confidence on any supply system. Sometimes a third overload trip has had to be added on site at appreciable expense.

The Need for Isolation

Another feature which calls for consideration is the isolating switch controlling the main supply; this may be either separate or combined with the starter. In the former case the switch merely acts as an ordinary isolator, whereas if interlocked with the starter and door or lid of the case it provides "safety-first" isolation, ensuring protection against accidental contact with live parts. Although this safety feature is not essential to comply with Home Office regulations, it is recommended by leading authorities.

Admitting the desirability of ensuring that the current is switched off before the door of the starting panel is opened, this logically implies that the motor should be made "dead" before access can be obtained to the terminals. In a small installation, where the care and attention of equipment may be left in charge of unskilled or semi-skilled labour, motors are commonly found operating with the terminal cover missing, thereby exposing the "live" terminals. A simple electrical interlock between the cover and terminal box, connected in the no-volt or contactor coil circuit would ensure the terminals being adequately protected before the motor could be connected to the supply. This would not entail any great cost, whilst it would give a protection that is not provided in the starting panel.

Circuit-breakers used in conjunction with starters were once considered to be of suitable capacity if able to deal with the particular motor circuit, but with the powers now available it is desirable to provide for a minimum rupturing capacity of 25,000 kVA. If the breaker were designed for such duty, the cost of the starter equipment would be unduly high, whilst the relatively small chance of a fault of this magnitude occurring would not warrant an expensive design of breaker. By incorporating high rupturing capacity fuses with a normal-duty circuit-breaker, the necessary protection is provided at a much lower cost and would appear to be the solution for all auxiliary circuits.

An Electrically Refrigerated Truck

A NEW delivery truck equipped with self-contained electric refrigeration has been constructed by the Transportation Department of the General Electric Company, of New York. The body, which contains the machinery, refrigerated compartment, and empty can compartment, is mounted on a 1½-ton chassis having a 157-in. wheelbase. Space is provided for loading a total bulk capacity of 315 gal. of ice cream. The electric motor-driven refrigerating unit is completely automatic. The all-metal body has an inner frame of wood heavily insulated. Hardwood floor racks and shelf provide for convenient loading of forty-two 5-gal. cans below and forty-two 2½-gal. cans on the shelf. The sheet-metal liner is entirely smooth (no evaporator obstruction) with rounded corners and air and moisture-tight seams.

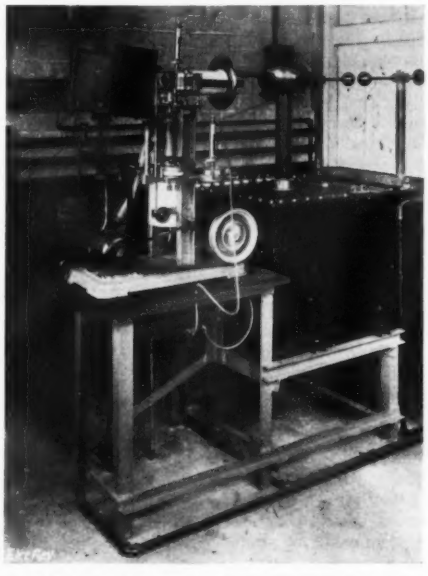
The a.c. motor-driven refrigerator is mounted in the machinery compartment. Operation is entirely under thermostatic control. Temperature is maintained at from zero to 8 deg. F. or is adjustable to suit requirements. Power is supplied en route by an a.c generator mounted in the machinery compartment and belt-driven from transmission power take-off. In the garage, or at a loading platform, power is taken from a 60-cycle, 220-V. single-phase power circuit. The cooling coils are mounted on the exterior of the refrigerated compartment walls.

Commercial Laboratory Equipment

APART from the all-absorbing theoretical interest pertaining to a group of modern large engineering laboratories, there is nowadays a broader interest in the electrical engineering laboratories of Metropolitan-Vickers Electrical Co., Ltd., in that much of the equipment which has been designed and used for the company's ordinary production development is now available commercially for works laboratories, test rooms and scientific institutions, &c. The following notes concern some of the apparatus now so available.

The discovery by the company of "Apiezon" low vapour pressure products, which are commercially available in the form of oils, greases, compounds and waxes, has led to the production of a wide range of glassless evacuated equipment using the grease distillate for sealing the joints on the high-vacuum side, the condensation pumps using the oils as the working fluid.

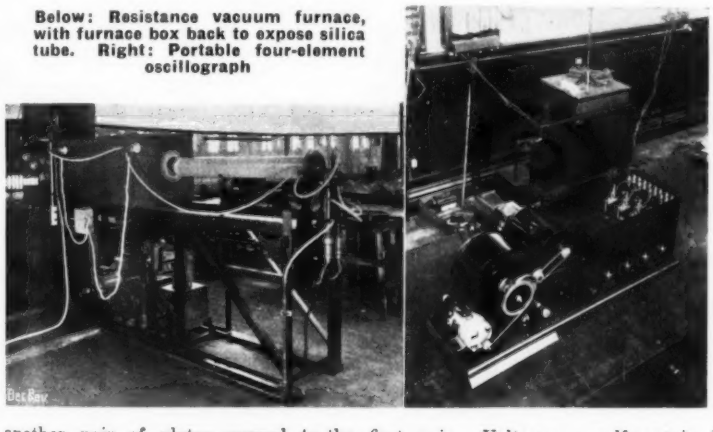
An X-ray equipment for crystallographic analysis, apart from the control equipment and the tube, consists of evacuating pumps and h.t. and filament transformers in one tank, all compactly mounted on a steel framework. About 6 ft. by 4 ft. floor space is occupied. For powder work inputs of 40 mA (peak) can be used with a copper target, and properly exposed photographs of a copper wire can be taken on a 9-cm. camera with only five minutes' exposure.



Crystallographic analysis equipment, showing X-ray tube, pumping gear and transformer

In the cathode-ray oscillograph a focused beam of swiftly moving electrons is projected on to a photographic film in a vacuum, passing, in turn, between a pair of parallel plates and another pair of plates normal to the first pair. Voltages applied to the pairs of plates result in independent deflections of the beam in the two directions. With one deflection proportional to the voltage to be measured and the other to the time, accurate records of rapid processes are obtainable on a stationary film. A particular use for the equipment is for the recording of ultra-rapid transients on transmission lines. Transients of 1/50th micro-second can be accurately recorded.

Below: Resistance vacuum furnace, with furnace box back to expose silica tube. Right: Portable four-element oscillograph



Resistance Vacuum Furnaces

A resistance-type vacuum furnace is designed for treating materials in vacua as high as 10^{-4}mm. of mercury at 1,050 deg. C. The furnace housing is mounted on wheels, and it can be easily slid back so as to leave the silica tube holding the material free for inspection.

Of the two types of oil condensation pumps produced by the company one is designed for operation against a comparatively high backing pressure, while the other has a high pumping speed in conjunction with a high ultimate vacuum. The former has a speed of 4 litres per second below 10^{-3} mm., and the latter 20 litres per second for the same pressure. The consumption in each case is 450 W.

For accurately testing the number of turns on widely varied coils there is a precision turns tester consisting of a transformer with a long core served by a primary winding which reduces magnetic leakage to a negligible value. The transformer secondary consists of a tapped standard coil, and the coil under test is so connected that the two induced e.m.f.'s are in opposition. When the two e.m.f.'s are balanced the turns are read directly from a dial. Coils of up to 3,000 turns and 8 in. long can be treated with an accuracy of 1 in 3,000.

The accuracy of apparatus for testing energy losses in magnetic sheet steel at high flux densities is due to the fact that magnetic leakage is practically eliminated by the use of a unique magnetising winding with a number of parallel connected sections. The apparatus provides for testing steel under alternating magnetism and enables energy loss and m.m.f. to be measured up to at least B 16,000 or B 18,000 with ordinary dynamo steel.

Two types of precision permeability measuring apparatus are available, one for testing strips of sheet material, and the other for testing solid rods. In both a known magnetising force is applied to a specimen in a low reluctance yoke, and the resultant flux B in the specimen is measured as well as that of the magnetising force, by search coils, &c. The sheet permeameter is suitable for testing bars of permanent magnet steel up to $\frac{3}{4}$ in thick. The instrument for round rods accommodates a standard test specimen 10 in. long and 0.5 in. dia.

Measuring equipment for transformer core-loss testing consists of a single-wave grid valve rectifier built into a robust case with an average (100 V) voltmeter, and a r.m.s (150 V) voltmeter.

Equipment for ratio error and phase angle measurement of voltage transformers is available in two types, one for ratios up to 200 : 1, with a maximum of 22 kV, and the other for higher ratios and pressures up to 300 kV. Both operate on the bridge principle.

Crack Detection

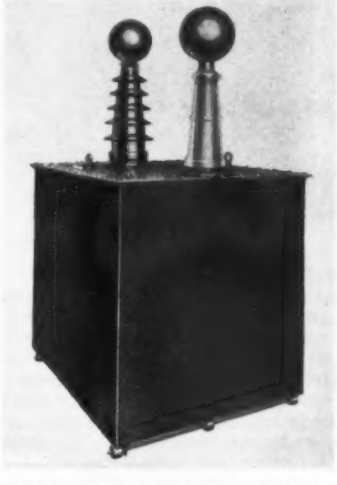
Magnetic crack detection apparatus employs the suspended iron filings in oil method, and provides for magnetisation of the part, immersion in or other treatment with the fluid, inspection and demagnetisation.

An oscillographic fluid pressure recorder consists of a steel diaphragm let into the tank wall near the point where pressure variations are to be measured. Variations in the deflection of the diaphragm are transmitted to the armature of an electro-magnet, thereby varying the reluctance of the magnetic circuit.

An a.c. bridge for power measurement is available for commercial testing and capable of dealing with machines up to 100,000 kVA at 11,000 V.

A portable four-element oscillograph is a self-contained unit which serves for analysing a wide variety of complex phenomena. It uses a wide film, provides the means for taking three consecutive records without reloading, and offers direct visual observations for recurrent phenomena. The four elements are of the bifilar type, and normally include one of the wattmeter pattern which has a laminated field magnet carrying a voltage winding, while the voltage units have permanent field magnets. The sensitivity of the elements is about 0.035 A per cm., and the resistance about 1 ohm.

Operation of the company's 3,000,000- and 1,000,000-V generators operating in conjunction with a



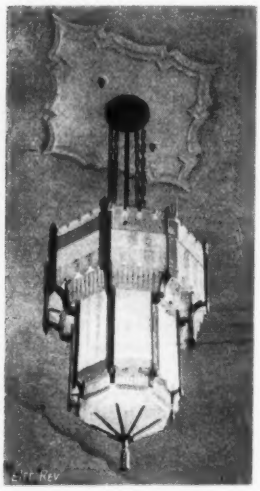
150-kV, 5-kVA transformer, fully insulated for 300 kV from ground

Lighting a Modern Office

TO find a better example of an up-to-date system of office illumination than that at the new London branch of the Co-operative Wholesale Society, Ltd., at Leman Street, E.1, one would have to go a long way. At the new premises which have been erected to house the administrative offices and the C.W.S. Bank, no effort has been spared to provide artificial lighting that shall be both efficient and in harmony with the general surroundings. Pictures of some of the more interesting features of the illumination scheme appear on page 895.

On entering the building one is immediately struck by the cheerful sunlight effect obtained in the entrance hall by the use of cornice lighting in conjunction with a colour scheme of pale green and yellow. The lighting fittings in the corridor (Troughton & Young) are of an unusual design, being semi-cylindrical in shape and formed of a combination of yellow glass and chromium-plated metal; somewhat similar circular fittings are also to be seen on the landings.

A great deal of care has been taken to eliminate glare and shadow in the general offices, where various types of G.E.C. and "Zeiss Ikon" fittings have been installed, and special Benjamin reflectors are used in the engineer's drawing office. In the various committee rooms and the directors' suite wood panelling of different kinds and hues is used extensively, and in each case the furniture and fittings have been chosen especially with a view to producing a pleasing ensemble and general feeling of comfort. So satisfactory has the Benjamin "Shadow" lighting fitting installed in the Finance Committee Room proved that it has been decided to extend this system of illumination to a number of other rooms in the building.



One of the large pendant fittings in the directors' dining room

The board room, committee rooms and dining room owe much of their artistic appearance to a well-designed scheme of cornice lighting employing Benjamin reflectors. Two effective pendant fittings (made by the General Electric Co., Ltd., to the design of the architect, Mr. L. G. Ekins) in each of two of these rooms add to the pleasing appearance, a Berry fire being installed to enhance the general impression of well-being. G.E.C. plain and "Cryselco" opal lamps are used throughout the building.

Although there is central heating throughout the building, all rooms are fitted with plug points in case electric fires are required at any time. In some of the private offices are installed G.E.C. built-in fires. Plugs are to hand everywhere for vacuum cleaners, floor polishers, &c. The kitchen, though not yet all-electric has a tendency in that direction, and contains a 6-kW electric cooker (Falkirk Iron Co.), a "Master-Jiffy" grill, and a large "Marco" refrigerator. "Pul-Syn-Etic" clocks—sixty-three in all—are to be seen all over the building, the design of each one being adapted to fit in with the general decorative scheme.

An exterior view of the new C.W.S. building in Leman Street, London, E.

To deal with the Society's immense number of accounts, "Hollerith" tabulating and sorting machines are used. A feature of the lifts (Waygood-Otis) is the cosy effect obtained by illuminating the interior by means of cornice lighting. A sprinkler installation by Messrs. Mather & Platt ensures adequate protection against fire.

With the exception of the main cables (Johnson & Phillips), the wiring throughout was supplied by the St. Helens Cable & Rubber Co., Ltd., the whole of the electrical installation work being carried out by the Society's Engineering Department under the direction of Mr. A. A. Scott, the chief engineer.

Commercial Laboratory Equipment (*continued from previous page*)

cathode-ray oscillograph has afforded valuable information on which it can design impulse apparatus for all classes of surge testing.

For the measurement of dielectric losses there is the Schering bridge, in which the high voltage is confined to the load and the air condenser, the resistances, &c., operating at slightly above earth potential, thus permitting the use of relatively cheap impedances.

There are available small high-voltage transformers which provide continuous current ratings of from 50 to 100 mA at from 50 to 350 kV peak, thus filling the gap between the usual small h.v. power transformer and the X-ray medical type of transformer.

High-voltage d.c. testing sets suitable for electrical testing in cable works, insulation factories, &c., each consist of a special high-voltage transformer control apparatus one or more thermionic rectifiers, and a bank of high-voltage condensers.

Measuring Noise

The principle of portable noise measuring apparatus is that of aural comparison of the complex noise under observation with a pure reference tone of fixed frequency and adjustable amplitude. To make a measurement an oscillator output is set to a standard value and the telephone earpiece is adjusted over one ear. With the other ear the observer listens to the sound under observation and adjusts the intensity of the 800-cycle note heard in the earpiece until it sounds equal to the sound under observation. A practised observer can determine the attenuator setting for equality to within ±3 db for moderately loud sounds, and ±2 db for loud sounds.

An oscillator for the investigation of the modes of vibration of machinery parts has a continuously variable frequency with very delicate adjustment, so that it can be set to correspond with the various natural frequencies of vibration of the body under investigation which it is vibrating simply by turning the knob giving fine control of the frequency generated and listening for the localised increases in the note emitted which mark the natural modes of vibration. The standard model covers the frequency range of 50 to 30,000 cycles and five overlapping bands.

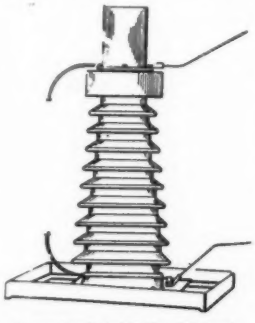
Equipment for providing for fatigue tests of machine parts or determining their natural frequency of vibration provides for clamping the part to be tested, so that it is free to vibrate, and arranging an electro-magnet and a contact device so that the test portion vibrates.

Slow tensile testing equipment developed costs less initially than beam apparatus and reduces attendant charges to a minimum. While specially designed for straining the specimen at a very slow rate under high temperature conditions, it is so constructed that it may also be used for ordinary tensile tests at normal rates of strain and at normal temperatures. Creep testing equipment will serve for determining creep rates as low as 10-8 strain per hour in from 400 to 500 hours, using an optical extensometer. A single 10 : 1 lever supports calibrated weights at its free end, the fulcrum and loading points being knife edges arranged to give constant leverage for all inclinations of the lever. The specimen is heated in a tubular electric furnace, and thermostatic control affords an accuracy to within ±¼ deg. C.

Sludge testing equipment for insulating and lubricating oils provides suitable means for undertaking the tests required by the British Standards Institution.

Oil-blast Fuses

THE efficient performances obtained from the latest oil-blast design of explosion chamber has suggested its use for a fuse, in which the contact rod is held by the fuse link against the compression of a powerful spring which, when released, withdraws the rod from the pot at a high speed. Such a fuse has been developed for 132-kV service and tested by the Central Electricity Board at Kirkcaldy grid sub-station, where a maximum short-circuit capacity of 500,000 kVA was available. A series of eight tests was carried out, the fuse interrupting this amount of power successfully in every case without apparent distress.



A typical 132-kV oil-blast fuse

The fuse comprises a porcelain shell such as is used on the top half of oil-filled bushings. This is covered at the bottom end by a steel plate to which is bolted, face downwards, an explosion chamber of the moulded bakelised paper type. The plate also carries the stationary contact and a magazine below to take twelve blown fuse caps. The top of the bushing porcelain is fitted with a hood, which contains the compression spring and forms a guide for the moving contact rod. The fuse comprises copper wire inside a glass tube with cemented ferrules at each end, one end screwing into the contact rod and the other engaging with the stationary contact which is of the spring collet type to hold the rod against the opening spring. The bushing shell is about half filled with oil to a level just above the top of the explosion chamber.

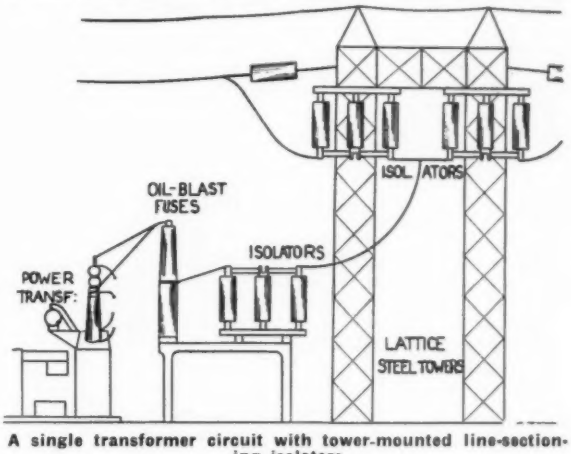
When the copper fuse wire blows, the glass is shattered and the rod is then released and raised at a speed of about 25 ft. per sec. by the compression spring. The arc drawn between the stationary contact and the retreating rod contact is extinguished in the explosion chamber by the oil-blast action, similar to that which occurs on an oil circuit-breaker. Reloading is carried out by screwing a new fuse-link on the end of the contact rod, removing the top hood and pushing the contact rod down with a ram-rod until the fuse engages with the stationary contact. The complete fuse-unit is mounted on a post insulator appropriate to the working voltage.

Similar designs are being developed at the British Thomson-Houston Co.'s Willesden works for 66 kV and 33 kV, particularly for service in conjunction with small-capacity power transformers tapping overhead lines, where the size of the unit or the loading conditions make the use of a regular oil circuit-breaker uneconomic. The fuse is primarily intended to protect the line against shut-down due to a transformer failure, and therefore only short-circuit protection is afforded—representing about ten times full load current; *i.e.*, the fuse will not be blown by a low-voltage fault which must be cleared by the l.v. oil circuit-breaker.

Advantages and Limitations

The oil-blast fuse has the following inherent advantages: (*a*) for 132 kV and 66 kV (and possibly 33 kV) it is cheaper than the equivalent oil circuit-breaker; (*b*) the operation is so rapid that the overhead line protective gear is not affected by transformer faults; and (*c*) the quick operation ensures that system stability is not impaired by a transformer fault.

On the other hand, it is impracticable to arrange for automatic reclosing which can be provided on an oil circuit-breaker; and further, it takes appreciably longer to reload the fuse than to reclose an oil circuit-breaker. For these reasons the application of the oil-blast fuse will, it is anticipated, be confined to relatively small transformers.



A single transformer circuit with tower-mounted line-sectioning isolators

An All-welded Factory

THE first of twenty all-welded buildings to be erected by the Bata Shoe Co., Ltd., has just been completed. These will include factories, offices, residences, a cinema, and recreation rooms on 600 acres of land at East Tilbury, Essex. As at Zlin, in Czechoslovakia, the company's headquarters, all steel frames have been constructed by electric arc welding, without rivets or bolts; by this method 11 per cent. has been saved in the weight of material.

Part of the shoe factory, East Tilbury, constructed entirely by arc welding

The area covered by the factory is 16,250 sq. ft. (260 by 62 ft.). An outstanding feature of the design is the extreme lightness of the trusses, and the fifty-six columns, twenty external and twenty-eight internal. The latter are of box section and are built up from two 3¼-in. by 3-in. channels, battened at intervals along the 13-ft. overall length; the base is of 14-in. by 10-in. by ¼-in. plate welded to the bottom of the channels.

The whole of the steel-work was delivered to the site in random lengths, and the components cut to length and bent by oxy-acetylene blow-pipe. The columns were erected first and levelled, after which each half-truss was lifted into position on the column tops. Where the two half-trusses meet in the centre, a punchion was erected under the joint and two 15/32 gusset plates were inserted between the struts and butted to the top and bottom tees before final welding. While the riggers were moving the pole and tackle from bay to bay, the welders fixed the channel cleats to the top boom ready for the wood purlins. The purlins and horizontal bracings followed in sequence.

The whole of the welding of ¼-in. fillets was carried out with 10G "Medex" electrodes similar to those used on the factory extensions of Murex Welding Processes, Ltd. They are of the fully fluxed general purpose machine-made type, free flowing and suitable for overhead and vertical welding, with a maximum stress of 27.8 tons per sq. in. and an elongation of 22 per cent. About 12,000 ft. of electrodes were used. The plant included two single-operator 100-A sets.

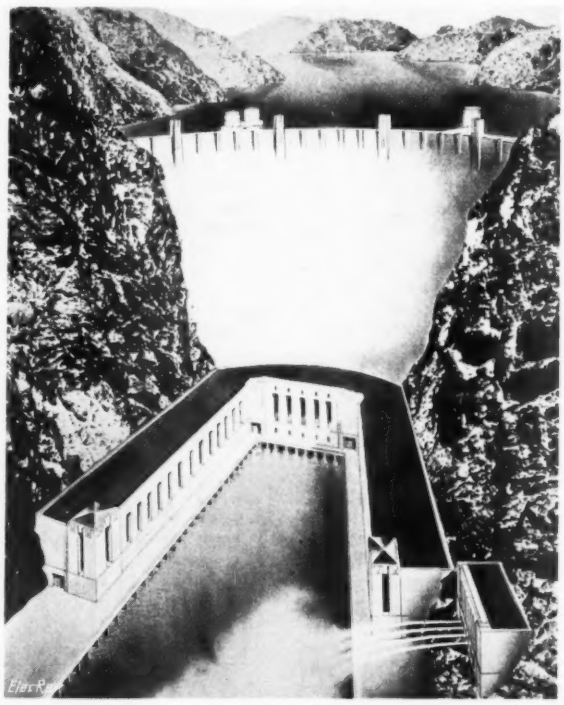
Progress on the Hoover Dam

A 1,800,000-h.p project

PARTICULARS of the Boulder Canyon project on the Colorado River, generally known as the Hoover Dam, have already been given in the ELECTRICAL REVIEW (November 20th, 1931, and November 18th, 1932). The contractors, Six Companies, Inc., are already one year ahead on a contract scheduled to take seven years from April, 1931. Before the commencement of the work contracts were entered into with the individual States for water and power supply that will provide for the entire amortisation of the cost, and thereafter provide a net profit estimated at nearly £1,500,000 per annum.

The Colorado River, with a flood discharge of upwards of 250,000 cu. ft. per second, rushes through a mountain gorge 1,200 ft. deep and only 400 ft. wide at the bottom at the rate (when in flood) of thirty miles per hour, the whole flow had to be diverted through four 50-ft. tunnels before a yard of concrete could be poured for the dam. These tunnels, each driven for about 4,000 ft. through volcanic rock, were finished six months ahead of time, and work on the dam has commenced.

The dam is of the arch gravity concrete type, and will rise about 730 ft. above bed rock, and create a lake 115 miles long that will store the average flow of the river for two years; it is said to be the largest artificial reservoir in the world. The dam and its appurtenant works will require nearly 4,500,000 cu. yds. of concrete, and the water pressure at the base will be 45,000 lb. per sq. ft. To provide against excess heat during the setting of this vast mass of concrete, refrigerated water will be circulated through 150 miles of 2-in. pipe. The entire development is now expected to be completed by April, 1936, and the United States transcontinental highway will pass over its crest. The next highest dam in the world is believed to be the 405-ft. Owyhee dam in Oregon, which was completed in 1932.



The Hoover Dam and power plant as they will appear when completed

The original intention was to install 1,200,000 h.p. in the power plant, but it is now announced that this has been increased to 1,800,000 h.p. in 115,000-h.p. units, the largest hydro-electric units yet planned. The largest similar undertaking with the majority of its plant now installed, is that on the Dnieper River in Russia, with an ultimate maximum capacity of 900,000 h.p. in 84,000-h.p. units. There may ultimately be two plants of 2,000,000 h.p. each on the St. Lawrence River in Canada, but the first of these, that on the wholly Canadian section, has so far obtained diversion rights for only 500,000 h.p., and the present Government appears to be unwilling to extend this; the treaty for the second, on the international section of the river, has not yet been ratified.

In Boulder City, the town commenced in 1930 on 200 acres of isolated desert, six miles from the dam, for the purpose of the development, the summer temperature frequently rises to 120 deg. F., and the large buildings for the contractors' men and for Government offices are artificially cooled in summer. Boulder City is of permanent construction, for it is anticipated that the accommodation for the operating staff and tourists visiting the highest dam and the largest artificial lake in the world, situated in the midst of wonderful scenery and adjoining three national parks, together with the necessary commercial and professional elements, will probably maintain the town at or near its present population of about 7,000. The United States Bureau of Reclamation has had to reconcile the conflicting interests of seven states and a foreign country (Mexico) in planning this project.

H. E. M. KENSIT, M.E.I.C., M.Am.I.E.E.

The Electrolytic Corrosion of Gas Mains

THE electrolytic corrosion of gas mains was discussed during the recent annual general meeting of the Institution of Gas Engineers at Liverpool. A paper dealing with the subject was presented by Dr. W. Beck, of Berlin, in which was described laboratory investigations with a metallic search electrode method with which measurements are made on all points of the surface of a pipe carrying an electric current and embedded in soil or immersed in liquids.

An electro-chemical method of finding defective places in a protected pipe medium is based on this. The metallic search electrode method aims at avoiding difficulties introduced by the necessity for digging up the soil, a procedure which changes the structure of the ground and makes it impossible to ascertain the exact conditions existing immediately on the surface of the metal under ordinary working conditions. These methods are necessarily cumbersome and require comparatively complicated instruments, which are expensive and not easy to handle. The process experimented with consists of attaching electrodes to the pipes and bringing the connecting wires to the surface where measurements of the amount of current flowing may be made. The author's work has also been extended to the examination of various types of pipe coverings, the object of which is to prevent electrolytic attack.

In the discussion Mr. S. C. Bartholomew, of the General Post Office, speaking in an "unofficial" capacity, said that the problem of electrolytic corrosion due to stray electric currents was becoming more and more acute, and in the near future he believed it would have to be tackled more seriously than it had been. He doubted whether the method dealt with in the paper could really be applied without disturbing the soil, and suggested that fixed testing points might not give the results required.

The law of electrolysis caused metal to flow from the anode to the cathode, and Professor Chappuis' view was that filaments of metal were thus deposited in the soil and decreased the resistance between the anode and the cathode as time went on. Thus a current of a few milliamperes might eventually reach, say, one ampere, but British Post Office experiments did not support Professor Chappuis' view. Mr. Bartholomew regarded protective coatings as of very little use, because there were bound to be cracks which would cause accumulation of current at such places and the damage would be concentrated there. To tackle this problem at the source one could encase the pipes in armour, or try to prevent the leakage. In America they joined pipes and cables actually on to the negative return of tramway or railway systems and so provided a path back conductively instead of electrolytically. In Europe isolation had been adopted, but Great Britain was in a half-way position because there were certain regulations of the Ministry of Transport which provided for the negative busbar being deliberately put to earth. Mr. Bartholomew pleaded for international co-operation in this matter.

Mr. W. G. Radley, also of the G.P.O., said that Dr. Beck's method was extremely difficult to apply under working conditions. Professor Chappuis' experiments were originally carried out with artificial soils and rather suggested that the degree of electrolytic corrosion depended entirely on the type of soil.

The O.L.A. in Somerset

A progressive distribution company's rural activities

ON Friday evening last about 120 members and friends of the Overhead Lines Association assembled in Bristol under the presidency of Mr. A. Lennox Stanton for the annual summer tour. The proceedings commenced with an informal dinner at the Grand Hotel, an early start being made on the Saturday morning for a seventy-mile coach drive through about one-fifth of the North Somerset Electric Supply Co.'s area.

The lovely country traversed included part of the Duchy of Cornwall estates, and at Pensford a long overhead line span showed how advantage has been taken of the undulating nature of the country. The span length between the four member poles is 1,150 ft., the size of conductor being 0.15 sq. in., the spacing between them 16 ft., and the sag 38 ft.

The climb up the lovely Blagdon Valley afforded a fine view of the Bristol Water Works Co.'s lake, noted for its

A group of O.L.A. "tourists"

trout fishing. Crossing the 900-ft. Mendip Hills, the descent was commenced through the Cheddar Gorge for luncheon as the guests of the company, of which Mr. J. H. Woodington is chairman and Mr. Frank Christie vice-chairman. The afternoon drive was *via* Clevedon, the company's birthplace, along the coast road to Portishead. There tea was partaken of as the guests of the Bristol Corporation Electricity Department (engineer and manager, Mr. A. J. Newman), after which the city's new generating station and adjacent grid sub-station were inspected. The route back to Bristol was through typical Somerset country along the River Avon and over the Clifton suspension bridge, which presented a new night aspect in its red and white electrical illumination (see page 918).

The North Somerset Company

The North Somerset Electric Supply Co., Ltd., was promoted by Messrs. Christie Bros. & Co., Ltd., of Chelmsford, by whom it has since been technically managed. It was registered in September, 1911, as the Clevedon and District E.S. Co., Ltd., afterwards changing its name to Clevedon, Portishead and District E.S. Co., Ltd., and since to its present title. During its development it absorbed the Winscombe and Cheddar E.S. Companies in 1928 and the Wedmore E.L. & P. Co., Ltd., in 1929, and it also controls the Mid-Somerset E.S. Co., Ltd., and the Burnham and District E.S. Co., Ltd. These undertakings, having statutory powers, are being continued as separate organisations linked up with the North Somerset Co.'s scheme. Bulk supplies are given to the South Somerset Co. at Martock, to the Burnham Co. at Burnham, and to the Mid-Somerset Co. at Street.

The company and its two subsidiaries are authorised to supply in a total area of about 600 sq. miles, with an estimated population of 160,000, comprising the city of Wells, the borough of Glastonbury, eight urban districts (Portishead, Shepton Mallet, Midsomer Norton, Radstock, Clevedon, Highbridge, Burnham-on-Sea, and Street), six rural districts (Long Ashton, Axbridge, Chitton, Wells, Shepton Mallet and Langport), and parts of the rural districts of Bath and Keynsham. Contracts for public lighting are in force in the city of Wells, seven urban districts, and in eighteen other towns and villages.

Overhead Lines

Electricity is purchased in bulk from the Bristol Corporation, metered at the Feeder Road generating station, whence it is transmitted at 11 kV to the Bower Ashton (two 0.05-sq. in. three-core cables) and Whitchurch (two 0.1-sq. in. cables) sub-stations that feed the principal ring main, which is overhead on wood poles and operates at 11 kV. This voltage was chosen to facilitate maintenance and stepping down in small units, though it was realised that it was not high enough to serve the whole area. Accordingly to stiffen up the system a 33-kV overhead line has been erected diametrically across the ring from Whitchurch, where it is fed by a 2,500-kVA step-up transformer, to Langport, where ultimately a supply will be taken from the grid. This line feeds the 11-kV system at one 500-kVA and three 1,000-kVA step-down transformer points. A pressure regulator, one of the first of its kind, is provided at the commencement of the 33-kV line and is over compounded to maintain constant voltage ten miles away.

Already about thirty miles of 33-kV lines, 221 miles of 11-kV lines, and approximately 350 miles of low-voltage lines have been erected, local distribution being at 400/230 V on the three-phase four-wire system. Hitherto all overhead lines have been carried on creosoted wood poles, but over 1,000 reinforced concrete poles (made in Cornwall by Ferro-Concrete Electrical Construction, Ltd.) have been erected more recently and are giving satisfaction. The old horizontal cross-arm construction utilised seventeen years ago carried the split neutral at the top, but since the Post Office ceased to recognise this as a guard line the vertical arrangement of conductors with swan-neck insulator brackets bolted through the pole has been adopted.

Predominant Power Load

The demand in the authorised area of supply has so far necessitated the erection of nearly 600 miles of mains and 135 transforming stations, the capacity of the latter varying from 10 to 2,500 kW. During 1932 the number of consumers was 9,667 and 6,234,049 kWh was sold for power at an average price of 1.26d., while 3,041,731 kWh was sold for domestic use at an average price of 4.37d. per kWh. A two-part domestic tariff was introduced in 1929 and under it 2,084,407 kWh was sold in 1932 at an average price of 2.75d. per kWh. An assisted-wiring scheme is in operation and domestic appliances may be hire-purchased, while a travelling showroom has now been in service for two years and is doing valuable educational work, particularly in the smaller villages. It is in charge of a sales engineer, assisted by a lady demonstrator, and when opened out for display purposes is capable of accommodating forty people. Apart from its headquarters in Bristol the company has branch offices in a number of towns and the larger villages, each provided with a showroom and in charge of a resident engineer.

As has already been indicated, the power load preponderates and is considerable. Among the larger consumers are quarries,

A span, 1,150 feet in length, over a valley at Pensford

water and sewage works, cheese and milk factories, brick makers, bakeries, boot factories, cider makers, collieries, laundries, lime works, paper mills, printing works, saw mills, tar macadam works, wireless stations, and lighthouses.

Educational

Prospectuses are now available of degree courses in technology at Manchester Municipal College of Technology. (See our classified advertisements.)

Electric Cooking

IN opening the discussion on the I.M.E.A. paper on "Electric Cooking" read by Messrs. P. J. Robinson and E. E. Hoadley, a report of which appeared in our last issue, Miss C. Haslett (director, E.A.W.) said that before the authors' comparative figures for meat shrinkage could be accepted further tests should be carried out. Hire charges for electric cookers should generally compare more favourably with those for gas cookers than they did; she preferred an all-in charge for hiring and current because she objected to several odd amounts added to the bill. She especially urged the encouragement of electric cooking among domestic science teachers. The Electrical Association for Women proposed to send out an inquiry to ascertain the woman's point of view regarding the modern electric cooker.

Mr. W. A. Gillott (English Electric Co.) asked what diameter of boiling plate the authors had in mind for 2,500-W loading which would be too high for satisfactory simmering at its "low" heat. A loading of 2,000 W allowed both satisfactory boiling and simmering, but a higher loading would call for modifications in design. Mr. A. E. McKenzie (Wimbledon) stated that in Wimbledon 86 per cent. of the total number of houses were connected, and there was one cooker in use for every 6.3 consumers. The authors had not mentioned the "Chromalox" concentric hotplate, which was both good and fast. Hotplates with 2,500-W loading would have only 50 per cent. of the present life, and reliability and long life were essential. Each cooker sent out by him had a two-way switch (at 2s. extra cost) and with nine out of every ten cookers he sent out a 1½-gal. water heater, which cost £4 10s. installed complete; its annual consumption was usually from 1,000 to 1,500 kWh. The consumption for electric cooking per person per day was generally accepted as 1 to 1½ kWh and the average for 3,500 cookers which he put out a few years ago was only 1,440 kWh per annum, costing the consumer £3 per annum, which at the end of the current month would be reduced to £2 10s. Plant had been installed for £50 at Wimbledon for stove-enamelling the old black cookers, giving them the appearance of vitreous enamelled cookers.

Experience at West Ham

Mr. J. W. J. Townley (West Ham) mentioned that of the 25,000 assisted wiring consumers in West Ham, 17,500 were prepayment-meter consumers, who were increasing at the rate of 5,000 per annum. A "penny-in-the-slot penny-per-unit" system had been introduced for all purposes (including lighting), the supply authority installing the cooker for an initial charge of 5s. to keep the frivolous person away. The Department was now installing as many cookers in a week as it previously installed in a twelvemonth. Mr. E. G. Batt (G.E.C.) stated that manufacturers were willing to co-operate on broad general lines regarding standardisation reserving their freedom in matters of detail. He mentioned a case in which fifteen manufacturers were asked to quote for about 200 cookers to a special specification; the firms incurred a cost of £1,000 in doing this. He suggested that the permissible limits of temperature of hotplates should receive the consideration of the I.M.E.A.-B.E.A.M.A. Committee.

Mr. J. K. Brydges (Eastbourne) admitted trouble with pilot lamps, even the neon lamps having exploded. He had used a cellulose spraying plant for reconditioning cookers, but the surface so obtained turned brown after a time and he now used a synthetic resinous-enamel with very satisfactory results. The reconditioned cookers were offered at a reduced rental. When consumers asked for a more modern cooker, £1 was charged to cover reconditioning. Councillor H. Coates (chairman, Watford) spoke of the success obtained at Watford with the radiant type of hotplate, and advocated the charging of a real hire price, keeping the unit price as low as possible.

Mr. T. Roles (Bradford) suggested that shrinkage with electric cooking was very much less than with 70 or 80 per cent. of the gas cookers now in use. If, in order to compete with gas hiring charges, electricity undertakings charged 16s. per annum for hire of the cooker and ½d. per kWh, the revenue of £3 could not be profitable. In Bradford they had sold 600 out of 1,200 old cookers to the users after taking into account the amount already paid for hire. Mr. H. A. Lingard (B.T.-H.) suggested that the increased loading of hotplates would be fatal and believed that an increase of the present voltage variation limits would be very serious to manufacturers who already had had difficulties owing to the variations in different parts of the country.

"Relatively Poor Results"

Mr. L. L. Robinson (Hackney) pointed out that development methods must take account of the various types of population. Electric cooking had been keenly pushed in Hackney since 1922 with relatively poor results. Some 1,613 cookers had been sent out, but only 972 were in use to-day. Consumers had rejected 522, and 119 were in stock, the balance having been scrapped. There was an average change of 100 tenancies per week, and possibly the incoming tenant possessed a gas cooker. The needs of the large Jewish population in Hackney were not met by the normal electric cooker, as electric cooking did not excel in deep frying. In Hackney only 0.32d. was left for the cost of the energy out of ½d. per kWh. He urged investigation into the extent to which the poisons in gas were absorbed in cooking. Tar was specially provocative of cancer.

Mr. A. Nichols Moore (Newport, Mon) urged that electric cooking should be pushed for its propaganda value rather than for profit. In Newport, good business was done at 1½d. per kWh, including hire and maintenance. He had not hesitated to take out 300 hired cookers which were not being properly used. Mr. H. W. Millatt suggested that there was no need for the limit of 30 ft. of free cable given in the paper, and favoured a combination of boiling and simmering plates on the cooker. At Bedford the pilot lamp was combined with the switch and sealed; consumers could not then take the lamps out and use them for other purposes. Tests carried out in Bedford on the comparative shrinkage with electric and gas cooking proved to be in favour of electricity, but this could be ignored as a selling point.

Mr. P. J. Robinson, in reply, stated that the gas measurements were made on standard gas meters used for testing. Cooking by electricity was considerably cheaper than by gas, and in grilling the cost was only half. The tests described in the paper were made on the latest type of gas cooker, which was the competition to be faced at the present time. The paper only suggested one highly loaded plate; simmering could be done on other plates. His own house had been all-electric since 1919 and his consumption was in the neighbourhood of 30,000 to 32,000 kWh a year. There were a large number of working class all-electric houses in Liverpool where the consumption was on the average 3,600 kWh per annum and the total cost compared very favourably with that incurred in other houses where coal, gas, &c., were used. A charge of 1s. 3d. per week was collected with the rent and 24 kWh was supplied for a shilling through a shilling-in-the-slot meter.

Meeting the Farmer's Needs

THE discussion on Dr. H. J. Denham's I.M.E.A. paper on "The Needs of the Farmer and the Responsibility of Supply Undertakings" was opened by Mrs. S. Z. de Ferranti, who expressed the view that, with a few exceptions, supply authorities had shown lack of enterprise with regard to agriculture and farming. She had had to bring great pressure to bear before she was able to get a supply for her dairy farm and then was compelled to pay £10 per kW per annum of maximum demand (with a minimum of £200 per annum) plus ¾d. per kWh. The three-years' agreement would come to an end next year and, failing better terms, she would put in her own plant. In such cases as these the Commissioners should intervene. Steam raised by electricity cost 2s. per day to sterilise all the utensils and milking machines for twenty-five cows once a day, but it was far preferable to do it twice a day as she would if electricity was half its present price.

Mr. S. E. Britton (Chester) advocated a standard kWh rate of ¾d. for farming; all other charges should be included in the standing charge. Another essential was that the supply authority should itself complete the whole installation. Except in special cases standard motors could be used for farming operations. The population of the 138 sq. miles of the Chester rural area was 27,800 with 6,200 premises. Of these, 3,015 premises were connected and the kWh used per consumer last year averaged 1,227. The average revenue was £7 0s. 10d., or 1.38d. per kWh. Included in the 3,015 premises were 300 farms with an aggregate area of 35 sq. miles and a total consumption of 579,719 kWh, or 1,932 per farm. The average income was about £16 10s. per farm and 1.93d. per kWh. Mr. Britton said that 107 oil, steam, or gas engines aggregating 793 h.p. had been replaced by 288 electric motors totalling 1,584 h.p. About 100 private lighting plants representing 360 kW and four village gasworks had been closed down.

Major Murphy urged supply authorities to support the Electrical Research Association which did not publish results until they were capable of immediate application. Mr. W. A. Turnbull (Aylesbury) said that the profit on the whole of the Ayles-

bury undertaking last year was £5,000, but on the rural supply only it was £10,000. Supply was given to farmers without any cost to them if they would guarantee to take £12 worth of electricity per annum. Soil-heating current was supplied at ½d. per kWh and the farmers paid 10s. per annum for the hire of a time switch to keep the load off the peak. Mr. A. J. Howard (Taunton), who said he was a member of a farming family, held that on the question of voltage variation engineers should be allowed to do their best according to their circumstances. Probably 99 per cent. of engineers did not comply with the official regulations.

Mr. R. W. L. Phillips (Bedford) said that in the Bedford experimental scheme, which had just completed its second year, all premises within an area of 100 square miles would be connected free of cost; results so far were considerably better than the estimates. Of 4,500 inhabited houses, 3,700 had been connected; these included 174 farms. The farmer should have a tariff of about 0.75d. per kWh as well as facilities for hiring all the apparatus he required, including milking machines in which the electric motor was integral with the apparatus. He was averse from increased voltage regulation tolerance because good regulation was as essential in rural areas as elsewhere. Mr. J. W. Burr (Swansea) said that in South Wales the distances between farms were often ten or twelve miles, and the farmers could not spend the money necessary to obtain a supply of electricity; greater flexibility in conditions of supply and tariffs were essential. Farmers must have apparatus on hire; they could not afford to buy it on the hire-purchase system. Mr. H. Wilson (Ashford) described a method which he had found successful which was to ask for a rental charge on the basis of £7 for every £100 spent in making the connection, this charge being reduced by 6s. 8d. for every £1 worth of electricity taken per annum. In this way it was possible for the farmer to wipe out the rental charge. It was also possible to capitalise the rent for poles.

Mr. F. E. Rowlands (G.E.C.) said that the information published with the intention of showing that private generation was cheaper than public supply was often misleading as it ignored depreciation, interest and insurance. Standard industrial motors were quite suitable for most operations, although sometimes frame-cooled or totally enclosed motors might be necessary. Electric pumps on farms were the best introduction of electricity for other purposes. A new development of special interest was electric steam sterilising chests with low loading. With electricity at 1d. per kWh or less there should be a big field for this application not only on farms but in other industries. He considered 1½d. per unit for soil heating somewhat higher than was generally considered practicable; this could be an off-peak load. Mr. M. M. Harvey (S.W. & S.E.P. Co.) referred to the agricultural and rural industry development department instituted by his company to handle the farmers' problems. Farmers were becoming more willing to have high-voltage lines across their farms so that the cost of giving them a supply would be less. If one farmer found any one type of motor satisfactory every other farmer in the district adopted the same type. He did not think the electrical tractor would oust the ordinary tractor for general work; the trailing cable was a great nuisance in farming operations. Councillor R. Matthewson (Chester) stated that all the supplies in Chester had been given under guarantee, although of a very different character from that mentioned by Mrs. Ferranti. The Chester system could be recommended to anyone seriously tackling this problem. Chester had been given permission some time ago to increase the limits of voltage variation to 8 per cent. if necessary.

The architectural features of Wakefield Cathedral are displayed to advantage by the floodlighting scheme installed for the city's pageant week

Dr. Denham, in his reply, referred to the voltage-drop question as serious in rural areas. They must never recommend anything to the farmer that was not absolutely certain in its results. In Germany the use of a 1½-h.p. motor was being advocated for practically every need on the farm, as it could be connected to the lighting mains and could be applied for each specific purpose.

The I.M.E.A. Annual Dinner and Meeting

THE annual dinner of the Incorporated Municipal Electrical Association was held in the Pavilion, Bournemouth, on June 15th, and was attended by more than 400 members and guests.

The Rt. Hon. Herbert Morrison proposing (in the absence of Lord Meston through illness) the toast of "The I.M.E.A.," suggested that the electricity supply industry could still learn much about sales organisation from the gas industry. The electricity supply industry as a whole was not yet adequately equipped to render the maximum service. We must make the consumer feel that the industry was being run not for the purpose of making profit or for relieving the rates, but for the primary purpose of rendering service. He was delighted to hear of the scheme to provide more money for the Electrical Development Association to spend on publicity and sales propaganda and organisation. He did not believe that an industry which contained some 660 separate supply authorities could be managed with that economy, vigour and aggressiveness which was essential to modern industrial development. Nor did he believe it possible to solve the problem by way of regional grouping of undertakings, by joint municipal authorities, or joint electricity authorities. His own view was that generation and distribution, so far as fundamental policy, direction, and responsibility for technical development were concerned, must be a definitely national and not a local responsibility.

The President (Mr. G. Porter), responding, said that electricity supply had reached the seventh position among the industries of the country by evolution rather than revolution. It had at present no real co-ordinating authority, and the various committees in the industry worked together on the basis of mutual goodwill and a genius for compromise which appeared to be suited to our national characteristics. Last year local authorities were requested by the Government to curtail expenditure, and the resulting false economy had tended to hamper the progress of the industry. Now was the time to prepare for the bigger loads which were to be expected in the near future, because the necessary materials were cheap.

The enormous expenditure upon the national grid system could only be justified by a very large increment in the output of electricity. The 500 kWh per head per annum which was the ideal of the Electricity Commissioners, was not sufficient. There was no reason why it should not reach 1,000 kWh if proper steps were taken to educate and encourage the public.

After the toast of "The Borough of Worthing and the County Borough of Bournemouth" had been honoured, Mr. P. J. Robinson (vice-president) proposed "Our Guests and Ladies."

Sir John Brooke (vice-chairman, Electricity Commission), who responded, urged the need for municipal authorities to secure the services of the most capable men in the industry by offering adequate remuneration.

The Annual Meeting

At the annual general meeting, held on June 16th, the following officers and members of Council were elected for the ensuing year: President, Mr. P. J. Robinson (Liverpool); vice-president, Mr. E. E. Hoadley (Maidstone); members of council, Messrs. J. N. Waite (Hull), A. J. Fuller (Fulham), E. Morgan (Sheffield), and Price F. White (Bangor), Alderman E. Huntsman (chairman, Nottingham), and Alderman W. H. Thickett (chairman, Grimsby); hon. treasurer, Major E. A. Barker (Barnsley); hon. solicitor, Mr. J. H. Rothwell (Brighton); hon. secretary, W. C. P. Tapper (Stepney). An invitation to hold the 1934 Convention in Liverpool was extended by the chairman of the Liverpool Electricity Committee (Alderman F. C. Wilson). The annual report and accounts were unanimously adopted and cordial votes of thanks were passed to the Mayor and Corporation of Bournemouth for placing the Pavilion and Winter Gardens at the disposal of the Association for the meetings and exhibition, and to others who had assisted in the organisation of the Convention.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

What the Public Want

In company with many others last week, I attended the I.M.E.A. Convention at Bournemouth, and since my return have considered all the matters seen and heard there. Not least among these were the rumours and hints of some drastic changes likely to take place in the electricity supply industry. These rumours rather remind one of the earth tremors and other phenomena which in volcanic districts portend some great eruption, which may open up new channels to prosperity or may impede further the progress of humanity.

If eruptions of this nature can be controlled is it too much to hope that those responsible will not lose sight of the final objective, which is the getting of electricity supply at a reasonable cost to the large proportion of the population who at present have not got it, and of reducing prices in those districts where the cost makes it prohibitive for uses other than lighting?

We hear of drastic changes in the composition of E.D.A., and while I have every respect and admiration for that body I suggest that what the people who have not got electricity want is an electric service—they do not want to read about it on the front page of their newspaper. The general public do know about electricity; what they now want is to get it at a reasonable price, and one satisfied consumer in each community will soon provide the necessary propaganda. Also, I think it should be borne in mind that the cost of propaganda eventually comes out of the consumer and that the availability of electricity at a low price and free of service charges will, to a great extent, furnish its own advertisement.

In these days travelling showrooms and demonstration vans are much in vogue. Why not a travelling commission to call upon engineers and, if necessary, committees throughout the country to find out the circumstances and conditions which are impeding or advancing the sale of electricity? With this information to hand it should be possible to get out a comprehensive scheme which while coercing some authorities might remove impediments from the paths of others and might ultimately lead to that cheap and abundant supply about which we have heard so much, but to which so many districts have not yet attained.

H. WILSON,
Ashford, *June 19th.* *Electrical Engineer*, Ashford U.D.C.

Metering and Tariffs

I regret to have to inform you that your report of my remarks at the I.M.E.A. Convention is inaccurate. It states:—

(a) "The suggestion that individual meter testing was necessary did not meet with his approval." I really do not understand what this statement means.

(b) "He did not supply electric light until all gas was removed from the premises." What I did say was that in houses where we put in a "free wiring" installation (for lighting and flat iron only) we were not prepared to share the lighting with the Gas Co., and therefore we make it a condition that the tenant will not use or permit the use of gas on the premises for lighting purposes, see par. 4 of the Conditions enclosed herewith.

You will note from par. 6 of the Conditions that the prepayment meters are adjusted for 2½d. per kWh in addition to the current flat rate charge of 4½d. per kWh, making at present 7d. per kWh in all. This covers the hire of the installation and flat iron, meter rental, free replacement of worn-out lamps, and all repairs.

ARCH. J. HOWARD.
Taunton, *June 19th.* *Borough Electrical Engineer.*

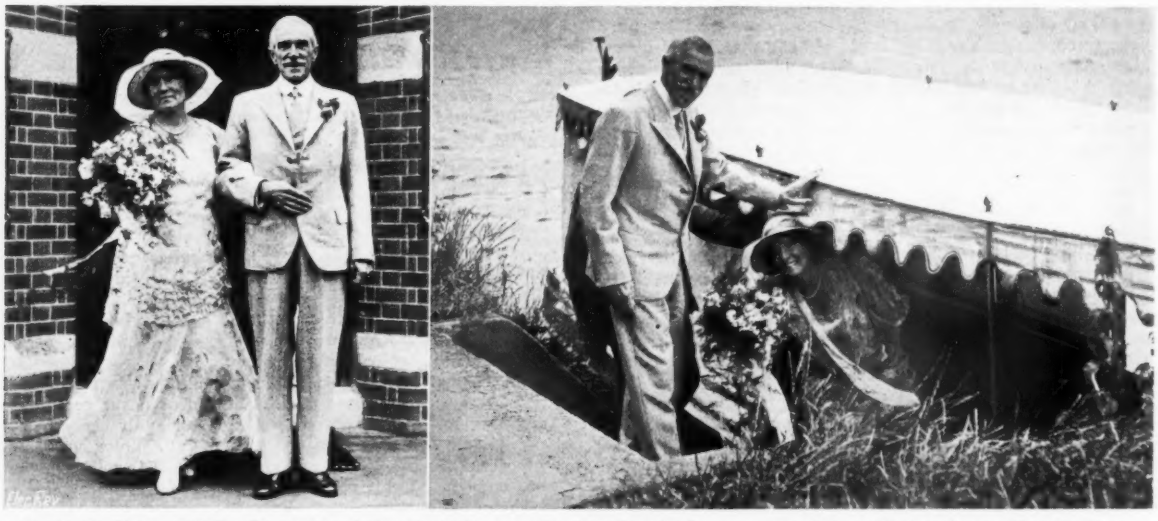
[The word "individual" in paragraph (a) should have been "independent" (*i.e.*, testing by an impartial authority). The error was due to telephonic transmission of the discussion.—EDS., ELEC. REV.]

Low-voltage Synchronous Clocks

In connection with the letter in your recent issue, signed "Interested," with regard to the operation of synchronous electric clocks from pressures as low as 6 or 12 V, we have pleasure in informing you that we have supplied numbers of clocks for voltages of this order, it being possible to wind our standard clocks for this low voltage, on request. We also, as you may be aware, supply small bell transformers, which are suitable for operating the ordinary electric bell system in conjunction with synchronous electric clocks, if desired.

At the same time we would remind your correspondent that the question of operating electric clocks from low voltages, such as those provided by bell transformers, was dealt with at some length in an article entitled "Electric Clock Wiring," by the chief engineer and manager of our Instrument Department, Mr. W. Holmes, A.M.I.E.E., in your issue of March 25th, 1932.

FERRANTI, LTD.
Hollinwood, Lancs, *June 16th.*



Mr. R. P. Sloan, C.B.E., Chairman of the North-Eastern Electric Supply Co., was married on Wednesday to Mrs. E. Hoar, at St. Peter's Church, Staines. Our photographs show Mr. and Mrs. Sloan at the Church and about to cross the Thames for the reception

With reference to the letters under the above heading in your issues of June 2nd and 16th, it may be of interest to point out that the British Standard Specification for Mains-operated Synchronous Clocks (No. 472-1932) makes special provision for clocks having a rated voltage of 50 V or less. This indicates that the committee responsible for drawing up the specification fully realised the possibility of the introduction of low-voltage synchronous clocks.

J. F. STANLEY,
Electrical Section, British Standards Institution.
London, S.W.1, *June 16th.*

Power Factor and the Consumer

The author of the article which appeared under the above heading in your issue of June 16th seems rather to have missed the point of the difficulty of explaining the meaning of power factor to a consumer. Unless the matter appears to be something that is likely to be to his advantage, the average consumer is not particularly concerned with power factor; the difficulty really arises when it becomes necessary to explain why it is he should pay more for a bad one, and for this purpose the author's analogy, as it stands, would appear to make the task more than usually difficult.

Having assumed that land is bought by the square yard and explained that although the sides of a parallelogram may

be of the same length as those of a square the area enclosed is smaller, Mr. Banner is faced with the difficult problem of explaining to the purchaser why he should pay more per square yard for a plot of land in the shape of a parallelogram than in the shape of a square. Perhaps the difficulty might be overcome by assuming that the plot has to be fenced by the vendor before it is sold. The cost of the fencing is obviously dependent only upon the length of the boundary line of the plot and not upon its area. If, therefore, the length of the fence remains constant as the area enclosed diminishes it is apparent that the price per square yard of the land must increase proportionately to cover the cost of the fence.

G. W. PRESTON.

London, W.2, *June 19th*.

A Cable and a Locomotive

The note relating to the testing of a tough-rubber-sheathed cable by running a locomotive over it, in the ELECTRICAL REVIEW of March 10th, is very interesting, but the load on the axle concerned should have been given. This would probably have been approximately 15 tons and about *half* of this would be pressing on the cable instead of the "spectacular" "110-ton locomotive." The figure of 110 tons must, I should say, include the loosely coupled tender. The weight of the locomotive used would be about 70 tons. These misleading expressions spoilt the scientific value of such tests to those acquainted with the facts. It is usual to be exact in tests.

G. L. PAYNE.

Matamata, N.Z., *May 11th*.

New Fans

THE hot weather began this year before many of the new electric fans had made their appearance, but a number of manufacturers have informed us that they have now brought out their new lines.

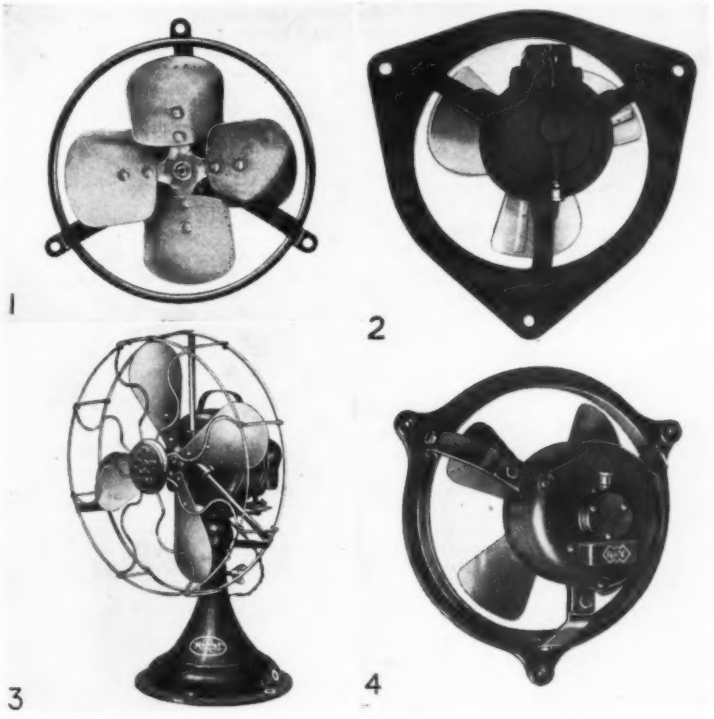
Messrs. Falk, Stadelmann & Co., Ltd., have added to their range of exhaust fans an 8-in. model with an air displacement of 250 cu. ft per minute, priced at from 36s. A 5½-in. diameter four-blade exhaust fan is also available (price 30s.); this will displace 100-110 cu. ft. of air per minute. It is particularly suitable for larders, bathrooms, &c.; its loading is 22 W d.c. or 28 W a.c., separate models being available for both supplies. In each case the motor is series wound, two-pole and semi-enclosed with phosphor bronze bearings.

The entire range of table and bracket fans made by the General Electric Co., Ltd., is new. There are table fans for a.c. and d.c., with 10- to 16-in. blades, priced at from £2 8s. to £5 2s., and they are now provided with totally enclosed motors, with the exception of the d.c. types, which have a small opening on the underside of the shell to facilitate inspection of the commutator. The fan guard is clamped by means of spring struts, instead of being screwed to the motor body. In the exhaust fans the main improvement relates to the terminal box which now forms part of the end cover and is drilled to take conduit.

This year's new models introduced by Messrs. Berkeley & Young are a range of light exhaust fans. Both a.c. and d.c. types are available with 10-, 12- or 16-in. blades, the prices run from £2 10s. to £4 14s., the smallest model being capable of displacing 750 cu. ft. of air per minute and the largest 2,435 cu. ft.

The "Sunairo" fan, marketed last year by the Sun Electrical Co., Ltd., has been replaced by the "Diana," a similar model but finished in black enamel with highly polished brass blades and guards.

A range of new fans has been introduced by the British Fan and Electric Co., which includes 9- to 36-in. three-blade a.c. fans, giving an air delivery of from 750 to 11,000 cu. ft. per minute and priced at from £5 to £26 15s.; 9- to 36-in. d.c. models with a delivery of from 750 to 13,000 cu. ft. per minute and priced at from £5 8s. 6d. to £25 10s. 6d.; porthole fans, ceiling fans and desk and bracket fans obtainable with an oscillatory movement and a.c., d.c., or universal motors.



Some of the new season's fans: 1. Falk, Stadelmann & Co., Ltd. 2. British Fan & Elec. Co. 3. General Electric Co., Ltd. 4. Berkeley & Young, Ltd.

The London Joint Authority

ON Monday last the London and Home Counties Joint Electricity Authority gave a luncheon at the Savoy Hotel in honour of Mr. W. F. Marchant, O.B.E., who has retired from the chairmanship of the Authority after serving in that capacity for five years. The guests included many men prominent in the London electricity supply world—chairmen and chief engineers of the principal supply companies, chairmen of municipal electricity committees, and representatives of the Central Electricity Board and the Electricity Commissioners.

Mr. Marchant's health was proposed by Ald. B. J. Samels, L.C.C., who succeeds Mr. Marchant as chairman. The speaker took the opportunity of stating at some length the origins, history and objects of the Joint Authority and its part in the national grid scheme. He said that it had been Mr. Marchant's aim upon his appointment as chairman in 1928 to remove with as little delay as possible all obstacles, statutory and otherwise, which might prevent or retard the fruition of the benefits of the grid and in this aim he secured the sympathy and support of the Central Board and the Commissioners. Upon the considerations which Mr. Marchant put forward the Authority based its general plans for the co-ordination of electricity supply and distribution in the area under its control. The success which had been achieved was set forth in a leaflet which was circulated to the guests.

Mr. Marchant, in the course of his reply, said that he had stepped into the chairmanship almost accidentally but once there he realised the necessity for a thorough study of the situation and a definite scheme for the future. He was convinced that nothing would restore the prosperity of the country but a proper employment of electricity.

The toast of the guests was proposed by Viscount Falmouth, who made special reference to the presence of Lord Ashfield, Sir John Snell, G.B.E (Chairman of the Electricity Commission), and Col. R. E. B. Crompton. He spoke of the legislative handicaps imposed upon electricity supply in its early days but said that perhaps those present would have adopted the same "parochial" view in similar circumstances.

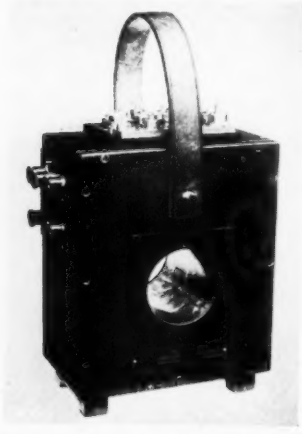
Sir John Brooke (vice-chairman, Electricity Commission) replied, stating that he was doing so on behalf of Sir John Snell, whose medical advisers had ordered him to conserve his energy as much as possible. Referring to the important part played by Sir John Snell in the framing of the 1919 Act, the speaker reminded those present that that Act proposed to divide the country into electricity districts each with a joint authority. The original idea of compulsory purchase was modified to voluntary amalgamation, thus changing the Commissioners in that particular aspect from legislators to propagandists. In consequence only a few authorities were set up, but among them was the important London J.E.A., which covered an area in which one-fourth of this country's electricity was consumed. The authority, aided by the energy and skill of its chief engineer (Mr. F. W. Purse), had achieved a great deal of success and by amalgamation with the concurrence of all parties had created out of unsatisfied areas one satisfied area. Much had been due to Mr. Marchant who handed on to his successor a lighter task than he assumed.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Current Transformer

The new "Nikron 25" current transformer made by MESSRS. ELLIOTT BROTHERS (LONDON), LTD., Century Works, Lewisham, S.E.13, provides facilities for a.c. testing with the highest degree of precision and is eminently suited for use in a standardising laboratory, electricity supply station, or works test-room. It is mounted in a case provided with strong leather holding straps and weighs 15¼ lb. A series-parallel latchet-type switch for connecting the low-range primary windings is fitted on the case, and terminals with a short-circuiting switch are provided for the secondary winding. There is a 3-in. hole through the centre of the case for taking the primary cable for the higher ranges—that is the twenty ranges from 40 to 1,200 A, one turn being necessary for the highest and twenty for the lowest. The secondary current is 5 A, and the core is of nickel-iron alloy. The five ranges from 5 A to 30 A are obtained by means of the internal primary windings of the latchet switch. The rating is 10 kVA, but with any figures up to 30 kVA the ratio and phase errors are claimed to be within the limits for class "A" current transformers under B.S.S.81. At 10 kVA the ratio error is 0.3 per cent., and is practically constant down to 1 kVA on all ranges. The phase error does not exceed fifteen minutes. The price of this equipment is £26 5s. 6d.



The "Nikron 25" current transformer

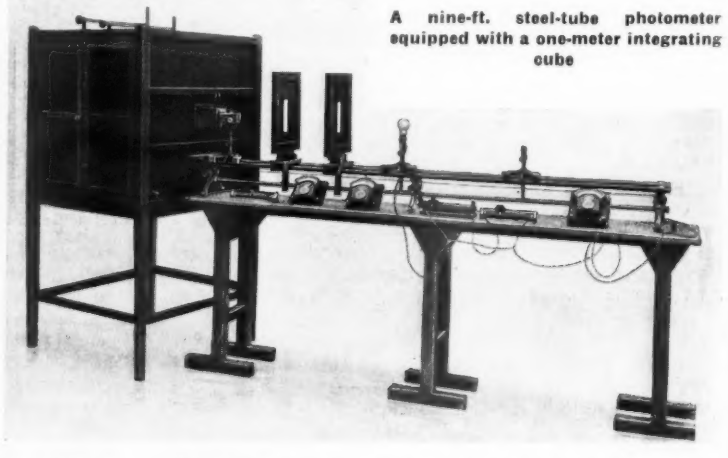
Photometer Developments

Parallel with advances in lamp manufacture and the increased handling of lamps in quantities, MESSRS. ALEXANDER WRIGHT & CO., LTD., 1, Westminster Palace Gardens, Victoria Street, S.W.1, have improved and extended their photometer equipment.

One of the most interesting of these developments is the increase in the size of the integrating cube for the standard steel-tube photometer and integrating cube combination. Cubes are now available up to two metres, and they differ from the construction of the smaller models in that the six sides are of sectional construction for assembly on site. A skeleton cradle is supplied to bring the testing aperture of the cube to the photometrical access of the bench.

The apparatus illustrated has a half-metre integrating cube. It is constructed of well-seasoned hard wood, suitably framed, the outside being finished dull black and the inside an even white. Lampholders and screens, plugs and switches, and connection for the standard lamp control complete the equipment. The photometer proper is suitable for lengths up to 9 ft.

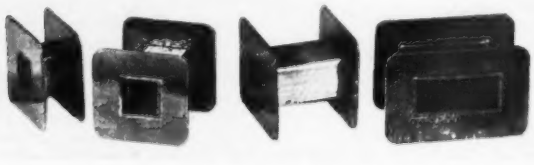
Among other equipment in which various improvements are to be found are a portable photometer bench for electric lamps, a Bunsen electric lamp testing photometer, Simmance's flicker photometer and Simmance's portable street photometer designed for testing street lamps up to 10,000 candles.



A nine-ft. steel-tube photometer equipped with a one-meter integrating cube

Transformer and Choke Coil Bobbins

MESSRS. MCLEOD & MCLEOD, LTD., 329, High Holborn, W.C.1, have recently extended their activities in the electrical field by the production of a range of "Mandem" bobbins for transformers and choke coils. The overall sizes vary from 2 in. by 2 in. by 1½ in. to 3⅞ in. by 2⅝ in. by 1¼ in., in fourteen sizes.



Some "Mandem" bobbins

The bobbins are constructed from tube and sheet "Bakelite," the flanges being stamped from the sheet and built on to mandrel-wound tube. The ends are cemented rigidly into position by special acid-free cement, and the completed bobbins are treated with several coats of hard-drying insulating varnish.

Various sizes are available for use with "Stalloy" laminations, and the company also makes special impregnated cardboard and presspahn bobbins for l.f. transformers, meter coils, &c.

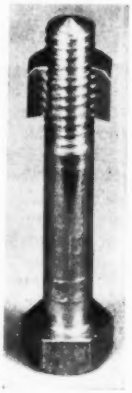
A Self-locking Bolt and Nut

Many electrical manufacturers and maintenance men will be interested in the "Dardelet" self-locking bolt and nut introduced by BRITISH DARDELET THREADLOCK, LTD., Chase Road, London, N.W.10.

The special thread incorporated is of the heavy "square" type, but the inner (recessed) surface of the bolt thread and the corresponding outer (projected) surface of the nut thread are slightly sloped outwards towards the point of the bolt. The nut projection takes up little more than half the width of the bolt recess.

When the nut projection is at the bolt head side of the recess the nut moves freely. When it is at the bolt point side of the recess, owing to the increased diameter of the bolt metal at that point, the nut firmly grips the bolt.

With the nut projections on the head sides of the recesses the nut can be freely screwed on until it bears on a surface. The nut projections will then be moved automatically towards the bolt point sides of the recesses, and when screwed home the corresponding surfaces will become wedged or jammed. The nut can be removed in the ordinary way with a spanner.



Nut and bolt threads in unlocked position

A Room Thermostat

One of the most important advances in design in the new "R.G." thermostat room switch, produced by the DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton, Middlesex, is that the base plate carrying the terminals can be wired up and fixed to the wall at any time prior to actual installation of the switch, so guarding against soiling decorations, &c.

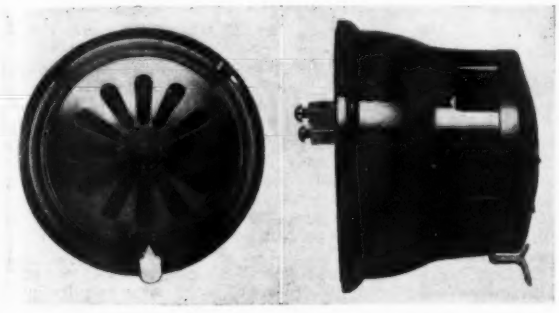
The back plate can be mounted on an ordinary standard conduit box, or a sunk wood box, or surface mounted on an ordinary switch block. Terminals at the back of the plate connect with brass angle strips in front, which are slotted to receive the insulated fixing screws for the case. The slots provide for actual setting of the case on site by a slight turn after turning the indicators to the actual temperature of the room to obtain the switch break.

The "Bakelite" case has two separate compartments, a front one housing the bi-metal element, and the back one accommodating the mercury switch. The spiral bi-metal coil is slightly helical, stepping forward towards the centre, which increases its cooling qualities.

Easy assembly of the coil unit is provided by a central bush fixed *via* a bracket to the outer end of the coil, which fits closely into the hole in the "Bakelite" partition and is locked on the other side by a horse-shoe metal piece which is designed to slide into slots formed in the projected metal bush.

The mercury switch incorporated is made by the Mercury Switch Manufacturing Co. Provision for a three-terminal switch is afforded by a third terminal on the base plate. The

one size of case will accommodate four sizes of mercury switches, 3, 6, 10, and 15 A, for 250 V a.c. or d.c. A tag



Front and side views of the "R.G." thermostatic switch

inside each switch carries relevant information for the consumer. The operating differential is 1½ deg. F.

Spot Welding Machine Control

In ordinary spot welding it is not always possible to say whether all the welds are sound, and reliance has to be placed on the skill and conscientiousness of the operator. Also when welding non-ferrous metals the colour change is so small that some form of automatic control is almost essential.

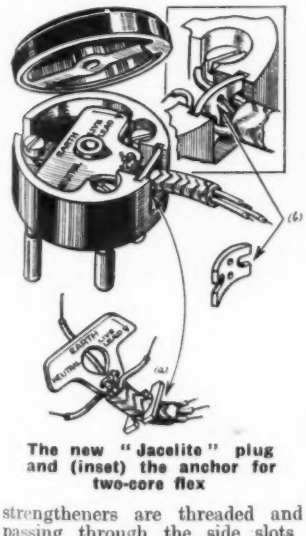
A new G.E.C. flat-pin switch plug

To meet this difficulty BRITISH INSULATED CABLES, LTD., Prescot, Lancs, are now able to supply an automatic current control gear for attachment to any make of pedal or hand operated spot welding machine.

The apparatus, which is patented, is similar in principle to that fitted to the makers' large automatic spot welders, and consists of a contactor and differential relay, the welding circuit being broken when the voltage between the welding tips has dropped to a predetermined value.

A New Cord Grip Plug

The growing popularity of unkinkable flexible has led MESSRS. J. A. CRABTREE, Lincoln Works, Walsall, to place on the market a new "Jacelite" plug fitted with special cable grips and anchors. The outer grip (a) consists of two wedges of hard vulcanised fibre. For the smallest size cable the bottom wedge is reversed; for the largest size the wedges may be dispensed with altogether. For intermediate sizes, however, the wedges can be reversed, transposed, or individually discarded to give more than a dozen different cable-entry sizes. It will be noticed from the illustration that one wedge is deeper than the other. When the fixing screw is tightened up the wedges exert a firm grip upon the flexible, thereby eliminating any strain on the plug terminals.



The new "Jacelite" plug and (inset) the anchor for two-core flex

In addition to the outer grip the two-pin plug is provided with an additional device (b) for anchoring the inner heald strengtheners embodied in some types of twin-core flexible cable. The anchor is provided with two holes through which the strengtheners are threaded and knotted, the cable cores passing through the side slots as shown inset. When a two-pin plug is being wired with unkinkable flex the anchor is used in place of the outer grip.

The special shield supplied with the three-pin plug serves three purposes: it shields and insulates the earth lead from those carrying current; it indicates the standard order of connecting the earth, live and neutral cores; and provides facilities for securing the heald cord strengtheners. In the last instance the cord strengtheners are threaded through the two holes and tied securely. The plug is available with two or three pins and is made of brown "Bakelite."

A Low-priced Washer

MESSRS. L. G. HAWKINS AND CO., LTD., 30, Drury Lane, Kingsway, London, W.C.2, are now marketing a "Supreme" wash boiler at 27s. 6d. (6-gal. size).

An automatic washing device is included in the equipment, and heat regulation is by two well-protected switches. The brass draw-off tap is not quite at the bottom, so that a little water always remains as a protection against boiling dry and burning out the elements.

No solder is used in the construction all joints being electrically welded; heavy gauge material is employed, and the galvanising ensures freedom from rust. Unbreakable wrought handles and legs are fitted, and the elements and switches are enclosed in a seamless compartment in the bottom. This, together with a special element clamping device which does not pierce the bottom, renders leakage into the element compartment impossible.

The "Supreme" wash boiler

The elements themselves are copper sheathed throughout, and the special clamping device allows the replacement of any element by removing three screws. Four feet of three-core c.t.s. cable are supplied, and several models are available—6 gal., 2 kW; 8-gal., 2 kW; 8 gal., 3 kW; and 10 gal., 3 kW, with galvanised finish or mottled blue, priced at from 27s. 6d. to 71s. 6d.

An Ignition Coil and Condenser Tester

The "Ardwick" ignition coil and condenser tester is a new product of the RUNBAKEN MAGNETO CO., LTD., 280, Deansgate, Manchester, intended chiefly for use in garages. It can be used for testing coil windings, condensers, distributors, rotors, sparking-plugs, magneto armatures, and wiring systems.

The "Ardwick" tester

The turning of a handle causes the internal contact breaker to operate twenty times per revolution, so that tests may be made at equivalent to slowest or highest engine speeds up to approximately 3,500 r.p.m.

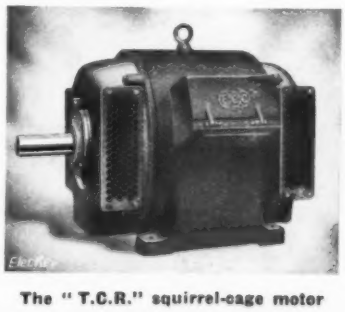
The price is 49s. 6d. and the construction very robust.

G.W.B. Developments

G.W.B. ELECTRIC FURNACES, LTD., Elecfurn Works, North Road, Holloway, N.7, inform us that their "Kleenard" open hearth hardening compound is now available in additional size tins, and that their "Nokase" anti-carburising mixtures are now being marketed in paint and powder form as well as in the form of clay.

New Induction Motors

New productions of the ELECTRIC CONSTRUCTION CO., LTD., Ingersoll House, 9, Kingsway, W.C.2, are the "T.R." (slip-ring) and "T.C.R." (squirrel-cage) B.S.S. two- and three-phase induction motors. Both motors are made in the following types: screen-protected, drip-proof, pipe-ventilated, totally enclosed air-blast self-cooled, and totally enclosed. No fan is provided for the totally enclosed type; for the others the fan is fixed at the driving end and carried off a c.i. hub fitted to the shaft; it can be withdrawn over the bearing without removing the latter. The air is expelled at the driving end. The totally enclosed types are interchangeable mechanically with the others, the only difference being that ribbed machined covers are fitted over the stator and also over the rotor windings.



The "T.C.R." squirrel-cage motor

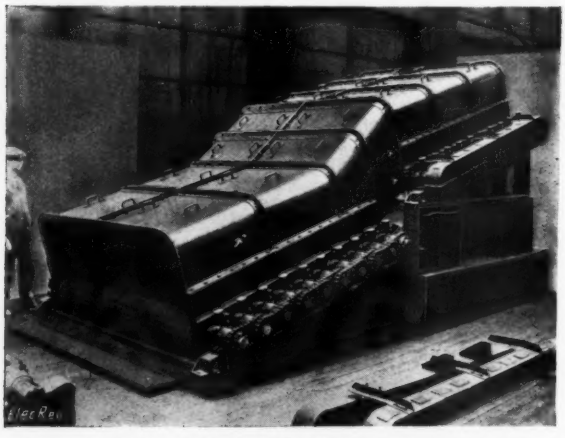
The m.s. shaft is of large dimensions so that with standard pulleys a third bearing is unnecessary. Roller bearings are fitted at the driving end in all sizes. The smaller machines have ball bearings at the other end; the larger have roller bearings with a separate

ball location. In all except the smallest sizes of "T.R." machines a brush-lifting and short-circuiting device is standard, and consists of a hand-wheel operated three-point knife switch. The slip-ring motors are designed to start against full-load torque with full-load current, or, alternatively, 1½ f.l.t. with 1¾ times f.l.c.

Type "T.C.R." machines are designed to give with direct switching ½ f.l.t. with 5 to 6 times f.l.c., with auto-transformer starting ½ f.l.t. with 2½ to 3 times f.l.c., and with star-delta starting ¼ f.l.t. with 1¾ to 2 times f.l.c. For high-torque motors the ratings are reduced by about 20 per cent. With direct switching twice f.l.t. is obtained with 5 to 5 times f.l.c; auto-transformer starting gives f.l.t. with 2 to 2½ times f.l.c., and star-delta starting ¾ f.l.t. with 1.3 to 1.7 times f.l.c.

A Giant Rotary Grizzley

The illustration below shows a giant grizzley which has just been made at the works of MESSRS. FRASER & CHALMERS, Erith.



A large Fraser and Chalmers-Robins rotary cataract grizzley

It will handle 1,000 tons of coal per hour, screening 770 tons of 1-in. mesh through, and consists of two units working in tandem, each having ten shafts 84 in. wide with 9½-in. discs.

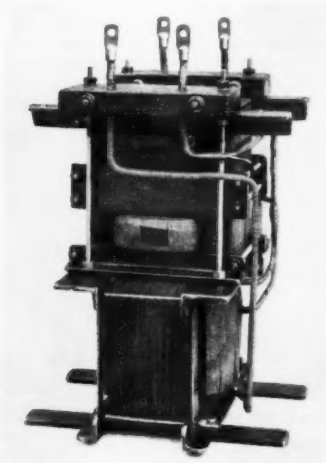
A New "Mazda" Valve

The latest addition to the range of "Mazda" radio valves marketed by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, W.C.2, is the P.D.220, which brings really good power loud-speaker performance within the easy reach of battery-receiver users. It is virtually two valves in one bulb, and operates on the principle known as "Class B amplification." Yet, notwithstanding its large power output, its consumption of anode current is very economical, since it takes power only in proportion to the strength of the signal being received. In many battery receivers its use will actually reduce the total demand from the anode battery. The new valve costs 14s.

A Voltage Booster

Although strictly speaking the "Apex" pressure controller, recently introduced by the FOSTER ENGINEERING CO., LTD., Apex Works, South Wimbledon, S.W.19, is a pressure booster rather than a primary voltage regulator, it may be considered as the latter in the many cases where equipment is required to overcome difficulty of compensating for voltage drop.

The apparatus can be in the form of either a double-wound transformer, in which the regulation is represented by either steady voltage at all loads, or a voltage increase with load increase, or it may be an auto transformer in which a boost is determined by the amount and nature of the load supplied.



A typical Apex pressure controller

Ordinary transformer principles as to winding ratios, &c., are applied. The two reactances are connected in series between one outgoing transformer terminal and a specified tapping, so that under no-load conditions they act as a potential divider, and their characteristics are such that the desired output pressure is obtained between the dividing point and the other outgoing terminal of the transformer. The reactance connected to the end of the winding has a closed iron circuit, and its inductance is such that its terminal voltage does not increase appreciably under load conditions. The other reactance carrying only a small proportion of the load has an air gap, and so affords considerable voltage increase on load.

With a load at unity power factor the outgoing terminal may be considered as supplying resistance load from a closed core inductance, and the load and inductance voltages therefore have a considerable vectorial angle of difference. With the change from its no-load position the inductance vector does not increase greatly in length, but the pressure applied to the second inductance increases considerably, although the current in it has only risen in proportion to its increased terminal pressure. With suitable proportioning, then, of the two inductances, the secondary pressure on load is greater than that on no-load.

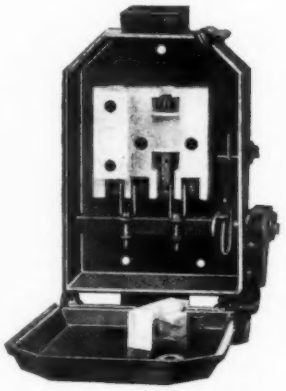
Equipment is at present available to give up to 7½ per cent. voltage increase from no-load to full-load, and can be made for any practical working limits. A 50-kVA controller, affording a voltage increase of 15 V at full load and a kVA boost of 3.26, measures 27 in. wide by 20 in. deep by 45 in. high, and weighs 450 lb.

Switch-fuses and Splitters

The new "Keyway" double-pole switch fuse and switch splitter are being marketed by the HENDERSON WIRELESS AND ELECTRICAL SERVICE, Electrical House, Queen's Road, Brighton.

Both models have ample room for wiring, and are fitted with interlocking handles which prevent the cover being opened when the switch is in the "on" position.

The rating is 15 A, 250 V, the switchfuse (G. 2215) being priced at 6s., and the splitter (G. 2145) at 8s. 8d.



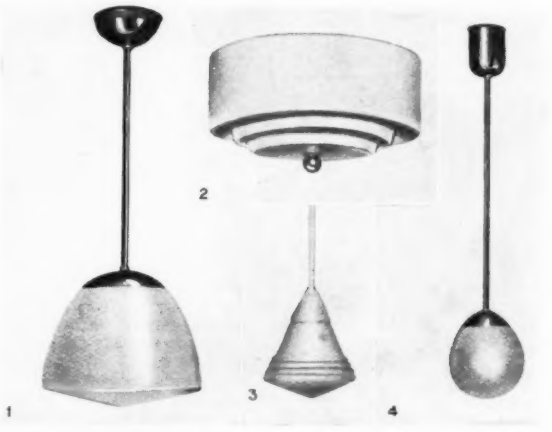
The new "Keyway" switch fuse

Modern Lighting Fittings

MESSRS. PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2, have recently increased their range of modern type lighting fittings.

The "D.S.28," priced at 29s. 6d., specially suitable for rooms with low ceilings, is entirely enclosed and incorporates a new method of suspension. The bowl fits flush with the ceiling without any visible means of support except for a small nickel-plated knob. The smooth surfaces ensure a minimum collection of dust.

Two further additions to the "Phililite" range are the "D.O.32" (29s.) and "D.Q.15" (19s.). The new method of suspension applies to both. Screws are entirely eliminated



New "Phililite" fittings: (1) DO.32; (2) DS.28; (3) the hospital fitting; (4) DQ.15

and the tube suspensions harmonise particularly well with the general design of the bowls. The "D.Q.15" is specially designed for corridor lighting.

A new white enamelled suspension fitting for hospitals and nursing homes has been designed with smooth surfaces to simplify cleaning, whilst the unit is dustproof and impervious to chemical action. This fitting can be supplied with a special device enabling two lamps to be used, one for normal illumination and the other as a night light.

The "R.26" and "R.33" ceiling galleries have been altered in shape and the construction improved and strengthened. A plate inside prevents dust from collecting inside the bowl.

Australian Electrical Imports

THE following figures showing the values of the imports of electrical goods into Australia in the fiscal year 1931-32 have been taken from the recently issued official trade returns. For the purpose of comparison, notes of increases or decreases as compared with the previous year are given. The decline extends throughout all groups except wireless valves.

	1931-32. £	Inc. or dec. as compared with 1930-31.
Meters under 1 h.p. (separate)—		
Total	18,000	— 40,000
From United Kingdom	5,000	— 7,000
,, United States	11,000	— 34,000
Dry cells—		
Total	2,000	— 1,900
From United Kingdom	300	— 2,200
,, United States	1,700	+ 500
Nickel-alkaline batteries—		
Total	60	— 90
Storage batteries with plates larger than 7¾ in. × 10 in.—		
Total	1,300	— 1,500
From United Kingdom	1,300	— 1,200
Other batteries—		
Total	8,800	— 24,200
From United Kingdom	5,000	— 21,500
,, United States	3,700	— 4,200
Cable and wire (cotton-covered)—		
Total	6,000	— 8,000
From United Kingdom	5,000	— 9,000
Cable, telegraph and telephone, paper insulated, lead covered—		
Total	1,600	— 100
Other telegraph and telephone cable—		
Total	2,600	— 19,900
From United Kingdom	2,600	— 19,100
Power cable, paper insulated, lead covered—		
Total	11,000	— 44,400
From United Kingdom	11,000	— 44,000
Other cable and wire—		
Total	253,000	— 161,000
From United Kingdom	205,000	— 150,000
,, United States	27,000	+ 1,000
,, Germany	12,000	+ 7,000
Carbon manufactures—		
Total	37,000	+ 5,000
From United Kingdom	9,600	— 1,400
,, United States	12,000	+ 3,000
,, Germany	4,000	— 1,000
,, France	11,000	+ 5,000
Dynamo-electric machines, a.c.—		
Total	134,000	— 49,000
From United Kingdom	125,000	— 30,000
,, Switzerland	500	— 1,500
,, Germany	800	— 800
,, United States	5,000	— 14,000
Dynamo-electric machines, d.c.—		
Total	37,000	— 73,000
From United Kingdom	22,000	— 63,000
,, Germany	2,400	— 1,100
,, Switzerland	—	— 5,000
,, United States	12,000	— 2,000
Dynamo-electric machines, universal—		
Total	—	— 900
Fans, electric		
Total	2,700	— 14,600
From United Kingdom	1,200	— 1,500
,, Italy	1,300	— 8,300
,, United States	200	— 4,000
Small self-contained lighting sets—		
Total	—	— 1,700
From United Kingdom	—	— 400
,, United States	—	— 1,200
Induction coils, h.t.—		
Total	6,500	— 3,700
From United Kingdom	1,800	— 500
,, United States	4,600	— 2,800
Switches, fuses and lightning arrestors—		
Total	28,000	— 125,000
From United Kingdom	10,000	— 109,000
Heating and cooking appliances—		
Total	7,500	— 19,200
From United Kingdom	1,800	— 700
,, Canada	2,600	— 5,900
,, United States	1,700	— 10,000
Lamps, filament—		
Total	95,000	— 427,000
From United Kingdom	41,500	— 199,500
,, Hungary	400	— 3,500
,, Austria	2,000	— 17,000
,, Holland	10,600	— 201,400
,, United States	7,500	— 9,500
Measuring and recording instruments—		
Total	27,500	— 35,000
From United Kingdom	11,000	— 20,500
,, Switzerland	3,200	— 2,300
,, United States	7,900	— 11,600
,, Canada	800	— 800
,, Germany	4,200	+ 300
Regulating and controlling apparatus—		
Total	41,000	— 140,000
From United Kingdom	22,000	— 87,000
,, United States	17,000	— 43,000
,, Switzerland	400	— 2,900
,, Canada	500	— 900
Static transformers, not over 150 kVA.—		
Total	1,200	— 18,800
From United Kingdom	700	— 16,300
Static transformers, other—		
Total	700	— 29,300
From United Kingdom	400	— 26,600
,, United States	100	— 900
Arc lamps, except for kinematographs—		
Total	150	— 350
Telegraph instruments and appliances—		
Total	900	— 4,800
From United Kingdom	500	— 4,800
,, United States	400	—
Telephones—		
Total	5,800	— 23,700
From United Kingdom	3,300	— 18,100
,, United States	500	— 5,500
Telephone switchboards and appliances—		
Total	18,600	— 125,400
From United Kingdom	13,000	— 117,000
,, Belgium	2,100	— 500
,, Germany	700	— 1,800
,, United States	2,000	— 5,300
Vacuum tubes, electrical—		
Total	23,000	— 59,000
From United Kingdom	5,000	— 4,500
,, Holland	7,600	— 10,900
,, United States	9,900	— 44,000
Radio valves—		
Total	236,000	+ 25,000
From United Kingdom	33,000	— 36,000
,, United States	119,000	+ 44,000
,, Holland	82,000	+ 17,000
Radio receiving sets, accessories and parts—		
Total	65,000	— 75,000
From United Kingdom	11,000	— 19,000
,, Germany	6,000	— 8,000
,, Holland	1,000	— 21,000
,, United States	45,000	— 27,000
Electrical appliances, n.e.i.—		
Total	126,000	— 135,000
From United Kingdom	34,000	— 74,000
,, Canada	600	— 200
,, Belgium	200	— 1,200
,, Germany	41,000	— 4,000
,, United States	44,000	— 43,000
Electrical ware of earthenware, including insulators—		
Total	3,900	— 21,800
From United Kingdom	1,400	— 2,500
,, Canada	—	— 4,900
,, Germany	900	— 2,200
,, United States	200	— 10,500
Electrical insulating paper and boards—		
Total	9,000	— 4,000
From United Kingdom	3,100	— 3,400
,, United States	2,300	— 1,000

Conditions in the U.S.A.

A REPORT issued by the Department of Overseas Trade on economic conditions in the United States indicates that the low prices of agricultural products have been the principal cause of economic dislocation; from this have arisen the failure of industry to operate profitably, the reduced revenue of the railways, the suspension of new buildings, and the other symptoms of the ruling depression. Emphasis is placed on the impossibility of the complete commercial segregation of the United States and its dependence on foreign markets for a profitable outlet for its export surplus.

An analysis of the principal exports of electrical machinery and appliances during 1931 and 1932 is given below:—

	1931. Thous. $	1932. Thous. $
Generators and accessories	4,121	1,938
Primary batteries	3,481	2,319
Storage batteries	2,172	1,064
Transformers	2,027	1,117
Converting apparatus	1,205	287
Switchboard panels, except telephone	1,712	319
Switches and circuit breakers	1,292	502
Meters and testing apparatus	2,035	1,296
Motors under 1 h.p.	1,822	638
Larger motors	2,312	607
Accessories and parts for motors	1,761	771
Starting and controlling equipment	1,450	548
Electric refrigerators	8,626	4,732
Parts for electric refrigerators	3,004	1,963
Electric household washing machines	870	255
Electric vacuum cleaners	1,184	377
Domestic heating and cooking devices	1,048	391
Therapeutic and X-ray apparatus	1,123	641
Radio apparatus	22,635	13,312
Telephone apparatus	1,879	831
Ignition apparatus including spark plugs	2,103	1,928
Wiring supplies	4,448	1,924

Canada is the largest market for United States electrical goods, but in 1931 exports of electrical machinery to Russia in Europe were 37 per cent. above those of the year before, while sales to Canada decreased 40 per cent., with the result that Europe displaced North America as the leading market. Exports to other important purchasers, South America, Australia, Japan, and China, have also fallen heavily. Exports to the United Kingdom declined from $8,870,000 in 1931 to $2,949,000 in 1932.

The estimated production of electrical machinery, apparatus, and supplies in the United States amounted to $1,930 millions in 1930 and to $1,400 millions in 1931. The production values of several important items, such as electric refrigerators, washing machines, portable electric tools, electric lighting fixtures, and electric signs, are not included in the above totals. The decline shown in 1931 continued in more marked degree through 1932, when plant activity dropped to about 20 per cent. of capacity. Although the actual production total for the latter year is not yet available, the following orders received by eighty-four manufacturers give some indication of the decline in trade: 1930, $1,045 millions; 1931, $716 millions; 1932 (estimated), $343 millions.

The Future of the Electrical Industry

While it is unlikely that the demand for electrical equipment will continue to show a substantial decrease, since the volume of buying has receded to a point which must be considered to represent minimum consumption needs, even under present adverse economic conditions, no immediate revival is yet in sight. Industrial and commercial users are generally over-equipped, their buying power has been curtailed, and they are not likely to make purchases of anything but absolute necessities in the major classes of equipment even during the early stages of a general business recovery.

In the domestic appliance field, the depleted purchasing power of the public will retard expansion of sales. The radio industry, apart from being affected by the above restrictive factors, had to contend with price-cutting during the final quarter of 1932, and the indication was that it would be kept on an unprofitable basis for at least the first three to six months of 1933. However, in view of the fact that many branches of the electrical trade are still in the development stage, and, taking into consideration the further progress which is certain to be made eventually in the electrification of industry and the home, the ultimate outlook of the electrical equipment industry as a whole may be said to be definitely promising.

In the Courts

THE settlement of two libel actions for alleging collusion with the Eastbourne Corporation's consulting engineer in respect of tenders for electrical work was announced on June 14th before the Lord Chief Justice in the High Court. The plaintiffs were Mr. W. C. C. Hawtayne and W. T. Henley's Telegraph Works Co., Ltd., the defendants being the Pirelli-General Cable Works, Ltd., and Mr. C. M. Read, a sales engineer employed by that company.

Mr. Theobald Mathew, for the plaintiff, said that Mr. Hawtayne in 1931 was consulting engineer to the Eastbourne Corporation and in that year the Corporation proposed to carry out certain electrical work for which tenders were to be invited and it was the duty of Mr. Hawtayne to advise the Corporation as to the acceptance of the tenders. One of the tenderers was the defendant company by whom Mr. Read was employed. On April 14th Mr. Read wrote a letter to an official of the Corporation suggesting that Mr. Hawtayne was in collusion with one of the tendering firms and was likely to give undue preference to that firm.

As soon as the letter came to his knowledge, Mr. Hawtayne took proceedings. The defendants at once admitted that there was no ground whatever for the charge and had undertaken to make in Court, and publish in certain newspapers, an apology to Mr. Hawtayne and to pay to him by way of damages an agreed sum and the costs to which he had been put. W. T. Henley's Telegraph Works Co. was the company with which Mr. Hawtayne was said to have been in collusion. That company at once took proceedings and the defendants had agreed to make an apology in Court and to publish it. They also agreed to indemnify Henley's as to costs and to pay a named sum to a charity.

Mr. H. C. Marks, who appeared for the defendant company, said the company had no knowledge of what Mr. Read did, but, of course, it accepted liability and he, on the company's behalf, expressed deep regret that such a charge had been made. They desired to withdraw the charge unreservedly and to offer to both the plaintiffs their very sincere apology for the annoyance and distress which this baseless allegation must have caused. Mr. Duveen, for the defendant Mr. Read, said he associated himself with the expression of regret and the apology made by Mr. Marks.

The records were accordingly withdrawn on the terms agreed.

A Radio Patent Action

The hearing was continued in the Chancery Division last week before Mr. Justice Maugham (sitting with Professor E. V. Appleton as assessor) of the action brought by Marconi's Wireless Telegraph Co., Ltd., against Philip's Lamps, Ltd., to recover damages for the alleged infringement of letters patent No. 13636 of 1913 relating to improvements in receivers for use in wireless telegraphy and telephony granted to the plaintiffs and Mr. C. S. Franklin. The defendants challenged the validity of the patent and pleaded prior publication, prior common knowledge, lack of subject matter, and also of utility. They also pleaded that the specification was misleading and insufficient to enable the alleged invention to be carried into effect.

Mr. Whitehead, for the plaintiffs, continuing his address, dealt with the methods of producing wireless waves and the devices employed for the detection and reproduction in the receiving set of the sounds transmitted. He said that for many years the value of the grid valve of de Forest was not appreciated in this country, and this invention, remarkable and valuable as it was, yielded absolutely nothing to the inventor, he having allowed his patent to lapse. He was more successful in America. The definite problem to be solved was how to obviate the loss of energy. This had been accomplished by Mr. Franklin in his invention. The real object of the invention was to get a much increased selectivity.

Dealing with the question of infringement, counsel produced one of the defendant's receivers and submitted that it was one which in the terms of the claim in the plaintiffs' specification provided a receiving system of electric oscillations, that it contained a valve for magnifying oscillations, and that it was so rearranged that the circuit in which were set up the magnified oscillations reacted on the circuit in which occurred the oscillation to be magnified.

Mr. Hubert Gill, patent agent and engineer, gave evidence for the plaintiffs. He said that Franklin had solved the problem with which all constructors of wireless sets were faced, and that his solution had never been anticipated.

The witness said that the basis of the Franklin invention was that a valve circuit which was coupled back from the anode to the grid circuit so that it tended to generate oscillations, could be used in a receiving apparatus to give greatly increased selectivity without oscillation. The invention had been enormously used from very soon after it was made and was still used in wireless receivers generally. In his opinion, none of the documents relied upon by the defendants as anticipations in any way disclosed Franklin's invention or the methods of obtaining its results.

Mr. Gill described experiments carried out by the defendants in the presence of himself and representatives of the plaintiffs on an apparatus set up in accordance with the suggestions combined in an article by C. D. Linderedge entitled "Ionised Gas for Telephone Receivers" in the *Telephone Engineer* of September, 1912, one of the alleged anticipations.

His Lordship said that the problem on the question of infringement was whether the ordinary skilled person reading Linderedge would be at once led, if he wanted to go that way, to the idea embodied in the Franklin reaction patent.

Further examined Mr. Gill disagreed with the suggestion that the plaintiffs' tests were ineffective. Linderedge dealt with telephony and not with wireless. The defendants had given the Linderedge apparatus every advantage by making it what they believed Linderedge to mean, but although it did not fairly represent what Linderedge intended nobody with Linderedge's information would have found Franklin's intention in the apparatus.

Sir Stafford Cripps, who cross-examined the witness, quoted from an article on "Syntonisation" which appeared in the *Year Book of Wireless Telegraphy and Telephony*, 1913, which dealt with the way in which syntony contributed to selectivity. Mr. Gill agreed that it was well known in 1913 that it was necessary to use elements of low resistance if it was desired to get a sharp response and that if the resistance were reduced to as nearly zero as possible, reducing the loss of energy, maximum selectivity would be obtained. He also agreed that the phenomenon of reaction to give oscillation was known before 1913 as a scientific fact, but how far it was common knowledge he was unable to say. He denied that he considered the Linderedge document as at all a "dangerous" one from the plaintiffs' point of view. He also denied that the Marconi experiments at Hayes were ineffective or that the wrong methods were employed to obtain the results which the defendants alleged were indicated by Linderedge.

The hearing was adjourned.

Breach of Electricity Regulations

At the Middlesbrough Police Court on June 14th the Cleveland Products Company was fined 40s. and costs for breaches of the electricity regulations under the Factory and Workshops Act, which resulted in the death of one of its employés. The man (Alfred Dresser) was working in a shed where there was a lamp of the screw-top type suspended from a beam. It was decided to move the lamp to another beam. Dresser received it from another man, and walked a few yards. He was pulling the lamp over another beam when he shouted and dropped, and when picked up he was dead. The allegations were that the screw cap of the lamp was not insulated, and that the switch was in the earth circuit. The defence was that the lamp, being 25 ft. from the ground, was safe for all practical purposes, and that neither the directors nor the electricians were aware that the switch had been placed in the earth wire.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

ON June 13th, Mr. Hannon asked the Postmaster-General what precautions were taken to ensure that no wireless amateurs possessing certain types of sets could "listen in" to messages passing between London and New York; if any complaints had been received of tapping telephone lines between London and Montreal, India and South Africa; and what action was being taken by the Government to safeguard the secrecy of international telephonic communications.

Sir K. Wood said that so far as concerned the British terminals of the various overseas radio-telephone services operated from London, special equipment had been provided to ensure privacy of conversation against wireless listeners. Complementary apparatus was already fitted at the corresponding overseas terminals in practically all cases, and every effort was being made by the administrations concerned in the few outstanding cases to provide the necessary apparatus at their end at the earliest possible moment. No complaints had been received by the Post Office of tapping of telephone calls between London and any of the overseas countries with which telephone connection could be obtained in London.

Wireless and Electric Traction

On June 19th Mr. Holford Knight asked the Postmaster-General whether his attention had been called to the frequency of interference with wireless broadcast reception by electric tramway and trolley omnibus services; and what steps he proposed to take to safeguard the interests of listeners-in.

Sir K. Wood said that the difficulty could only be cured economically at the source. The Post Office assisted in devising and demonstrating suitable remedies and in general it found that the owners of the traction services were willing, in the interests of their customers in the locality, to make such comparatively small modifications of their plant as might be necessary to meet requirements. It had, however, at present no statutory power of insisting on the application of remedial measures, and it might be necessary to seek such powers.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Marking of Imported Valves

The Standing Committee (Merchandise Marks) appointed by the Board of Trade (under the chairmanship of Sir Hubert Llewellyn-Smith, K.C.B.) held an inquiry at the Board of Trade Offices on Monday last into an application by the British Radio Valve Manufacturers' Association for a Marking Order in respect of imported thermionic wireless valves and rectifying valves, excluding valves used mainly for industrial purposes other than wireless. The application was opposed by the Electrical Importers' and Traders' Association.

Mr. Malcolm Hilbery, K.C. (for the B.R.V.M.A.), said it was estimated that the members of the Association represented from 92 to 95 per cent. of the total manufacture of wireless valves in the United Kingdom. A number of the valves at present imported bore, either on the articles themselves or on their cartons, a trade name or trade mark of a dealer or trader in this country, and by reason of such marks they had also to bear indications of origin, as required by Part I of the Merchandise Marks Act; there was nothing, however, to prevent their being imported without the mark of a trader and without a mark of origin. Foreign-made valves, even though bearing indications of origin, were so advertised and marketed in this country as to create the impression that they were of British manufacture.

Evidence for the applicants was given by Mr. W. W. Burnham (chairman, B.R.V.M.A.), Mr. A. L. Parsons, and Mr. J. Y. Fletcher (director, G.E.C. and M.O. Valve Co., Ltd.), while witnesses for the opposition were Mr. W. H. B. Johnson (Caithness, Craven & Co.), Mr. L. M. Galansky (Chorlton Metal Co., distributors of the "Triotron" valves), Mr. Carleton Dyer (Philco), and Mr. J. Axelrad (Triotron Radio Co., Ltd.).

Mr. Challis, secretary of the Electrical Importers' and Traders' Association, said the object of the Act was not to emphasise the "foreign-ness" of the goods in the sense of furnishing warnings wherever possible, but rather to give a purchaser a reasonable opportunity of knowing whether or not he was buying British articles. The opponents to the Order were in favour of selling British sets, and were doing so, but could not see the justice of being forced to do the advertising of the applicants. The prices of valves had been influenced by importation, and anything which would cause the radio set makers here to be "blackmailed" into using British valves was in a different class from the proposals usually put before the Committee.

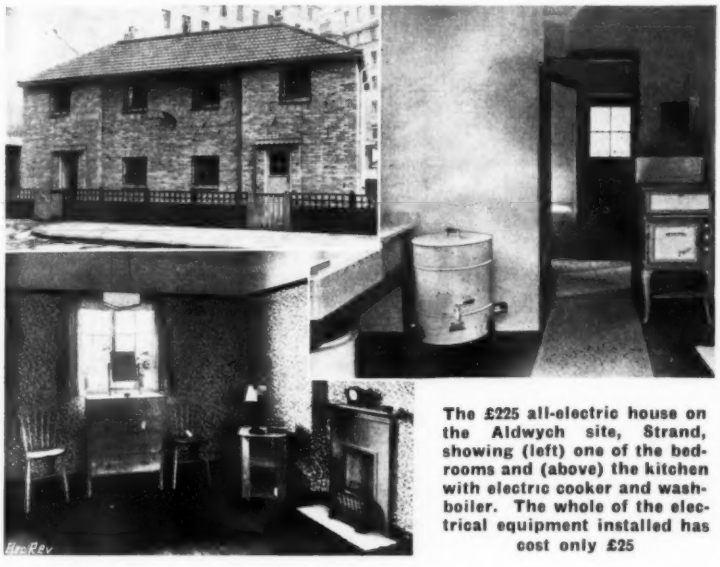
The inquiry was closed, and the Committee will report to the Board of Trade in due course.

Rent for a Travelling Showroom

Taking the view that the Oldham Corporation's motor electricity showroom, which travels about from place to place exhibiting electrical goods, competes unfairly with local electrical contractors and retailers who have to pay rates and taxes, the Lees Council has informed the Oldham Electricity Department that if it wishes the vehicle to take up a stand in the Lees market place a rent of £1 per week must be paid.

Special Ferranti Displays

In order to introduce a number of their new season's electric fires, radio receivers, and clocks, Messrs. Ferranti, Ltd., have arranged for special displays to be held in a number of the larger towns. Each display will be in charge of a Ferranti representative, and the dates and addresses are as follows:—June 19th-24th: Bush House, London; Chamber of Commerce, Birmingham; Grand Hotel, Bristol. June 26th-July 1st: Adelphi Hotel, Liverpool; Deansgate Hotel, Manchester; Victory Hotel, Leeds. July 3rd-8th: George Hotel, Glasgow; Turk's Head Hotel, Newcastle.



The £225 all-electric house on the Aldwych site, Strand, showing (left) one of the bedrooms and (above) the kitchen with electric cooker and wash-boiler. The whole of the electrical equipment installed has cost only £25

A £225 All-electric Cottage

The idea that the all-electric house is for the rich man only is again disproved, for a cottage costing only £225, yet electrically equipped throughout, can now be seen on the Aldwych site, Strand, London, as a result of a competition organised by the Building Centre for designs for a residence which would give adequate accommodation for a small family and which could be erected at a cost enabling a rental not exceeding 10s. per week, including rates, to be charged.

Over 300 sets of drawings were entered for the competition, and the cottage referred to is one of a pair erected to the design of the first (£100) prize-winner, Mr. N. E. Leeson, of Newcastle-on-Tyne; the other cottage is equipped for gas. Extending the whole depth of the house is a large living-room, alongside of which are a compact kitchen and bathroom, three moderate-sized bedrooms being on the first floor.

The electrical equipment was entrusted to the British Electrical Development Association, which has given careful attention to the probable requirements and means of the tenants and has installed nothing superfluous or out of keeping with the surroundings. The lighting fittings are inexpensive yet tasteful and efficient, a tubular fitting being very suitable for the somewhat restricted space available for the staircase lighting. Plug points are available in all the rooms, and Belling, Ferranti, and "Magnet" fires are installed, as well as a Ferranti electric clock. In the kitchen are a Jackson cooker and a "Hotpoint" wash-boiler, the cost of the whole electrical equipment for the house being approximately £25, including the cost of a small water heater not yet installed.

In connection with these cottages a special housing exhibition is now being held at the Building Centre, 158, New Bond Street, W.1, where other designs submitted for the competition are on show together with a special section showing inexpensive electrical and other equipment for small houses.

Electrical Machinery Exports in May

The following figures relate to the exports of electrical machinery from Great Britain during May, notes being made of increases or decreases as compared with the corresponding month of last year:—

	Quantities.		Values.	
	May, 1933.	Inc. or dec. as compared with May, 1932.	May, 1933.	Inc. or dec. as compared with May 1932.
	Tons.	Tons.	£	£
European countries	492	— 83	70,058	— 14,486
Japan	3	— 3	186	— 1,633
South American countries ...	35	— 128	5,975	— 20,147
South and South-West Africa	217	— 313	36,175	— 35,059
British India	271	— 213	38,585	— 28,459
Australia	40	— 7	7,795	+ 553
New Zealand	68	— 26	7,651	— 2,876
Canada	66	+ 27	11,636	+ 6,174
Other countries	229	— 117	30,332	— 13,941
Total	1,421	— 863	£217,383	— £109,874

Due largely to the fact that May had more working days than April, the figures on page 927 relating to electrical trade generally show improvements both in imports and exports.

Batteries in the Aldershot Tattoo

Over 1,000 "Drydex" cells and 550 "Exide" accumulators were supplied by Messrs. Burch & Vertue, Ltd., Aldershot, for the torch-light drill at the Aldershot Tattoo. Incidentally, some of the accumulators were in their fifth year of service, having been idle for periods of twelve months in a fully charged condition.

Price Reduction

The General Electric Co., Ltd., announces a reduction in the price of "Sashalite" photographic flashlight bulbs to 1s. 6d. each.

For Sale

Preston Electricity Committee invites offers for the purchase and removal of various electrical plant.

(See our classified advertisements.)

Osram Lamp Works Visit

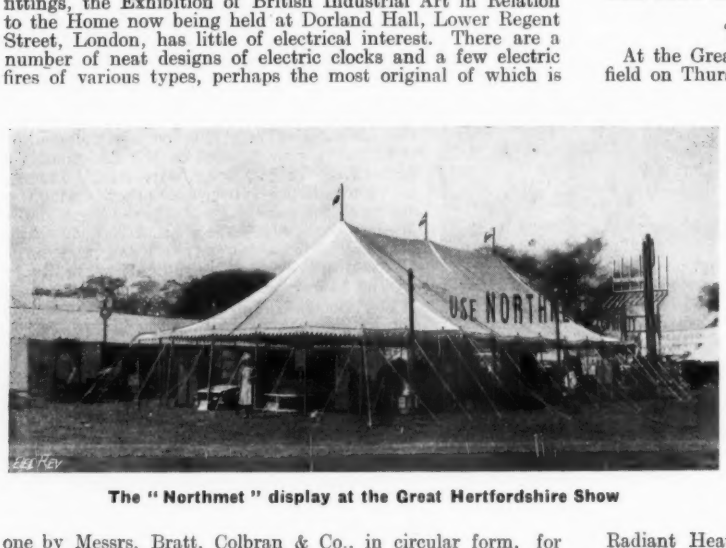
A large party of electrical contractors, radio dealers, and corporation supply engineers from Norwich and Ipswich visited the Osram lamp and valve works at Hammersmith and Wembley on June 15th, and witnessed the manufacture of Osram lamps and the new Osram "Catkin" radio valves. Mr. F. Crush, manager of the G.E.C. Ipswich branch, was in charge of the party.

Visits to Metrovick Works

Last Saturday afternoon the Batley and District Textile Society and the Huddersfield Students' Society paid a visit to the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd. The visitors were shown round the various departments and were given a demonstration in the High Voltage Laboratory. They were entertained to tea in the Staff Canteen.

The Exhibition of British Industrial Art

Apart from a very excellent display of modern lighting fittings, the Exhibition of British Industrial Art in Relation to the Home now being held at Dorland Hall, Lower Regent Street, London, has little of electrical interest. There are a number of neat designs of electric clocks and a few electric fires of various types, perhaps the most original of which is



The "Northmet" display at the Great Hertfordshire Show

one by Messrs. Bratt, Colbran & Co., in circular form, for installation away from the walls of the room and providing radiation all round. In the "Minimum Flat," which is designed primarily for one person, is a unique electric fire forming a part of a "hearth-scene," which also houses a radio-gramophone with a built-in loud speaker; a "Revo" cooker and an "Electrolux" refrigerator are used in the kitchenette. With regard to the illumination exhibits, much attention has been paid to concealed and tubular lighting, and chromium plating with various attractive designs of glassware is used to a large extent.

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Harvey, Briggs & Co., Stockport.
Broughton & Irlam Electrical Engineering Co., Hr. Broughton, Manchester.
Prentice, D. W. J., Fulham, W.6.
Glass, Cheetham, Manchester.
Tivoli Engineering Co., Preston.
Owen, A. L., & Son, Rustington, Sussex.
Collister, J., Plymouth.
Robson, L., Ltd., West Hartlepool.
Harland & Wolff, Ltd., Belfast.
Mackenzie, M., Gressington, Liverpool.
Shaw, John, & Co. (Electrical), Ltd., Hull.
Brooker Bros. (East Grinstead), Ltd., East Grinstead.
Waller, F. L., Levenshulme, Manchester.
Roberts & Bell, Walton, Liverpool.
Odell, A. Wm., Liverpool.
Whittaker, L., & Co., Cheetham Hill, Manchester.
Wynn, H., & Co., Hr. Openshaw, Manchester.
Tomlinson, W. J., Eardisley, Hereford.
Butterfield Bros., Ltd., Oldham.
Reddish, J. M., Blackley, Manchester.
Feather, F. H. H., Birmingham.
Thompson, A., Manchester.
Hammond, T. & E., Beaconsfield, Bucks.
Palatine Electrical Engineering Co., Manchester.
Paterson, J., Darlington.

At the same meeting five applications were withdrawn and eight were declined.

State Trading in Victoria

The Victorian State Parliament is to decide whether the Electricity Commission shall be prevented from engaging in retail trade, chiefly in electrical appliances, in competition with private enterprise. Some months ago the Ministry directed the Commission to withdraw from the retail business, but the Commission, acting on legal advice, claimed that under the Electric Light and Power Act it had full power to engage in retail trade and that any Ministerial direction was contrary to the provisions of the Act. The Crown Solicitor has given the opinion that it is doubtful whether the Commission has the power to carry on such trading, and that, assuming it has the power, the Minister of Electrical Undertakings has the right to direct that the Commissioners must not carry on these activities. Now the Cabinet has decided that it is desirable to give a full measure of permanence to any decision, and with that object is to introduce a Bill into Parliament.

Henley's at the I.M.E.A. Convention

While at the I.M.E.A. Convention we were presented with a jig-saw puzzle by W. T. Henley's Telegraph Works Co., Ltd. The box bears the inscription "Distribution of Electricity," and we hope to piece it together during an early wet week-end.

At the I.M.E.A. annual dinner, reported on page 905, a table display arranged by W. T. Henley's Telegraph Works Co., Ltd., consisted of two model grid towers strung to give a complete miniature span. The tower bases were glass-panelled and fitted with 40-W amber lamps, floodlighting the structures from below and giving a pleasing and decorative effect.

The "Northmet" in the Field

At the Great Hertfordshire Agricultural Show held at Hatfield on Thursday last week, the North Metropolitan Electric Power Supply Co. had a very fine electrical exhibit. It was arranged in two definite sections—domestic and agricultural. In the former a laundry, kitchen and bathroom were suitably furnished and equipped for electrical working demonstrations, and there was also a separate display of all manner of general apparatus. On an island site 75 ft. by 45 ft. much agricultural equipment was shown actually working, including cattle feeding machinery, soil and greenhouse heating installations, incubators and egg-grading apparatus, butter and ice cream making outfits, milking plant and refrigerators. The following were among the principal exhibitors:—The General Electric Co., Ltd., the Economic Dryer Co., Ltd., L. G. Hawkins & Co., Ltd., Santon Ltd., Smith's English Clocks, Ltd., Aidas Electric, Ltd., Kelvinator, Ltd., the Jackson Electric Stove Co., Ltd., Ferranti, Ltd., the Edison Swan Electric Co., Ltd., A. Reyrolle & Co., Ltd., the Singer Sewing Machine Co., Ltd., Hoover, Ltd., the Hotpoint Electric Appliance Co., Ltd., Thermega, Ltd., the Dowsing Radiant Heat Co., Ltd., Bulpitt & Sons, Ltd., Hague & McKenzie, Ltd., Belling & Co., Berry's Electric, Ltd., the British Central Electrical Co., the Metropolitan-Vickers Electrical Co., Ltd., F. A. Pullen, Bamfords, Ltd., the English Electric Co., Ltd., Ransomes, Sims & Jefferies, Ltd., Wolf & Co., Ltd., the Cooper-Stewart Engineering Co., Ltd., the Wolseley Sheep Shearing Machine Co., Ltd., Barford & Perkins, Ltd., R. A. Lister & Co., Ltd., Kelvinator, Ltd., Vaccar, Ltd., Curfew Electric Heaters, H. Church & Co., British Insulated Cables, Ltd., Bastian & Allen, Ltd., and Drake & Gorham, Ltd.

The R.A.F. Display, Hendon

The Marconiphone Co. is again carrying out the loud-speaker installation at Hendon Aerodrome on the occasion of the R.A.F. display which is being held to-morrow (Saturday). Sixty Marconiphone loud-speakers will be used, while the company's public address coach is again being used at Sunny Hill Fields, adjacent to the Aerodrome.

Trade Announcements

Messrs. T. Mason & Co., 95, Belmont Row, Birmingham, are opening a wholesale department for all kinds of small electrical products, and ask for trade catalogues, prices, &c.

The Wego Condenser Co., Ltd., now keeps extensive stocks of all its standard types of condensers at 61, Spencer Street, E.C.1 (telephone, Clerkenwell 8638).

Messrs. H. W. Rodda and Co. have moved to 158, Cambridge Road, Norbiton, Surrey (telephone, Kingston 3848).

The Macintosh Cable Co., Ltd., is moving its London offices to-morrow to Brettenham House, Lancaster Place, Strand, W.C.2 (telegraphic addresss, "Intoshmac, Rand, London"; telephone, Temple Bar 9071).

The Leicester branch of the General Electric Co., Ltd., is moving to-morrow to Magnet House, 33, Rutland Street.

Cantie Switches, Ltd., has removed its head office to the offices of its associated company, Brookhirst Switchgear, Ltd., at Northgate Works, Chester (telephone: Chester 971). The design and manufacture of its range of Cantie products have now been concentrated at the Chester works.

The London office of the Leipzig Fair has been removed to 34-36, Maddox Street, Hanover Square, W.1 (telephone: Mayfair 5641).

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have recently opened a new stores depôt at Dickerson Place, Coleman Street, Southampton, under the management of Mr. A. Boeree. The telephone number is Southampton 4539, and the telegraphic address "Henletel Southampton."

Owing to expansion of their business Messrs. Chatterton and Keen, Ltd., have removed to larger premises at York Mansion, 94/98, Petty France, Westminster, S.W. (telephone: Victoria 3678).

Electricity at an Agricultural Show

At the Essex Agricultural Show held recently at Rochford, Essex, a comprehensive display of electrical plant and apparatus of interest to farmers was arranged by Messrs. Playle, of Maldon, electrical and refrigeration engineers. The exhibit was divided into five bays, and included private automatic electric lighting and power plants and storage batteries by well-known makers, a full range of refrigerators for farm use, manufactured by British Automatic Refrigerators, Ltd., for whom Messrs. Playle are sole agents in Essex, Crompton lamps and motors, pumping equipment, cables, crude oil engines, a milk cooling installation, &c. The display, a general view of which appears herewith, attracted a good deal of attention and resulted in a large number of orders and enquiries.

Messrs. Playle's display at the Essex Agricultural Show

The Scottish Contractors' Conference

For the fourth year in succession the Electrical Contractors' Association of Scotland held its Annual Conference at Taymouth Castle, Perthshire, from May 26th to 29th. Upon their arrival members were welcomed by Mr. J. L. Anderson (Aberdeen), the president, and Mrs. Anderson. Immediately after lunch on May 26th the annual meeting was held. The annual report submitted recorded the deaths of two past presidents of the Association—Messrs. McWhirter and E. J. B. Lowdon. It was reported that a provisional agreement on behalf of individual agreement holders in the Association had been come to with the lamp manufacturers which would tend to put lamp trading on a more definite and recognised basis. The other trade agreements were reported to be working satisfactorily. Members were urged to support the publicity efforts of E.D.A. in which the Association takes part. New working rules had been prepared by the Board and were at present before branches. The membership at the close of the year was 283, a substantial increase on last year's membership. The accounts showed that the finance of the Association and of its benevolent fund were in a sound position. Mr. David Bennett, of Haddow & Co., Ltd., Glasgow, was elected president, and Mr. Andrew J. Shand, of A. J. Shand & Co., Edinburgh, vice-president. Mr. Walter Finlay, W.S., was reappointed secretary.

On May 27th papers were read by Mr. David Bennett ("Generalities") and Mr. W. Finlay, who explained in detail the Fair Trading Policy which has been formulated by Committee "D" and approved by the E.C.A. of Scotland.

The usual round of social events helped to make the gathering a very enjoyable one.

The Greenwich Industrial Exhibition

In conjunction with the Greenwich Night Pageant, which is being held during the current week at the Royal Naval College, an industrial exhibition has been arranged in the neighbouring gymnasium of the Royal Hospital School illustrating many industries of the borough. There are five displays of electrical interest arranged by Siemens Bros. & Co., Ltd., Johnson & Phillips, Ltd., the Saxonia Electrical Wire Co., Ltd., the Anglo-Swedish Electric Welding Co., Ltd., and Messrs. Keating & Miskin, electrical engineers and contractors. Messrs. Siemens display a representative collection of their manufactures, including submarine and underground telephone,

Messrs. Siemens Bros.' exhibit at Greenwich

telegraph, and power cables, "Neophone" telephone equipment, batteries, fuse boxes, loading coils, meters, &c. Messrs. Johnson & Phillips's exhibit has been arranged to give an impression of their leading manufactures, and includes specimens of various kinds of cable, switchgear, a pole-mounting oil circuit breaker, transformers, water heaters, loudspeaker equipment, instruments, and radio coils, &c. The stand of the Saxonia Electrical Wire Co., Ltd., bears a well-arranged display of the company's fine-gauge wires for electrical purposes, including flexible cords, automobile cables, lift cables, asbestos-braided flexibles for electric irons, cookers, and heating apparatus, trailing cables, &c. Samples of electric welding, electrodes, &c., are displayed by the Anglo-Swedish Electric Welding Co., Ltd., while Messrs. Keating & Miskin are showing electrical refrigerators, cookers, fires, etc.

A large number of floodlights of various colours are employed, while spotlights and effect projectors are used for the illumination of the various settings. This material was supplied jointly by the G.E.C. and the Strand Electric & Engineering Co., Ltd., the latter company carrying out the whole of the installation work.

A system of "Standard" loudspeakers is installed.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price, June 21st.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll... ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£203	£8 inc.
Grade II ... ... ,,	£139	£5 inc.
Grade III ... ... ,,	£68	£1 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	7¼d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 9¾d.	—
c ,, Wire, basis ... ... ,,	7¾d.	¼d. dec.
c Copper Tubes (solid drawn)... ... ,,	10¼d.	—
g ,, Bars (best selected) ... ... per ton		
g ,, Sheet ... ... ,,	£68	—
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£34 5s.	—
d ,, ,, Sheets ... ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£48	—
d ,, ,, H.C. Wire ... per lb.	7½d.	—
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5¾d.	¼d. inc.
i Iron, Pig. (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£14 15s.	5s. dec.
g Mercury ... ... per bot.	£8 15s. to £9 12 6	—
c Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	¼d. dec.
p ,, ,, rolled strip & sheet ,,	11d.	¼d. inc.
p ,, ,, wire ... ... ,,	1/0¼d.	—
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	9d.	—
r Steel, magnet, in bars ... ... ,,	7¼d.	—
n Tin, Block (English) ... ... per ton	£225 15s. to £227 15s.	£9 15s. inc.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	3d. inc.

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

Social Events

The second annual sports meeting between the staffs of the Lancashire Electric Power Co. and the Yorkshire Electric Power Co., comprising cricket, tennis and bowls matches, took place at Walkden on Saturday last at the Oakwood Sports Club by permission of Messrs. Burgess, Ledward & Co., Ltd. Although rain delayed the start and showers fell at intervals an excellent day's sport was enjoyed. The Yorkshire Electric Power Co. batted first, scoring 278 for five declared. The Lancashire team made 122 all out. The best individual scores were: A. Robertshaw, Y.E.P., 91; B. C. Ossitt, Y.E.P., 83, and Hy. Tasker, L.E.P., 44.

At tennis in the nine men's doubles matches, the L.E.P. Co. beat the Y.E.P. Co. by eight matches to one. In the bowls singles matches the L.E.P. Co. scored 308 points and the Y.E.P. Co. 215 points, L.E.P. thus winning by 93 points. In the doubles matches the L.E.P. Co., with 99 points won by 12 points. Mr. C. D. Taite, engineer and manager of the Lancashire Electric Power Co., and chairman of the Athletic Club, extended a cordial welcome to the teams of the Yorkshire Company and hoped that the contest would become a recognised institution of the year. Such events, Mr. Taite declared, were an excellent way of creating good will and a sporting feeling between the two sister companies. The two companies were founded at about the same time, had experienced a very similar history, and were making rapid progress along the same lines. The speaker expressed his keen regret that Mr. W. B. Woodhouse, engineer and manager of the Yorkshire Company, had at the last moment, owing to the pressure of exceptional business, found it impossible to be present. He heartily welcomed Mr. S. R. Siviour, mains superintendent of the Yorkshire Company and chairman of its Athletic and Social Club. In responding Mr. Siviour read a telegram from Mr. Woodhouse expressing disappointment at not being able to be present and wishing success to his teams.

The annual sports of the Chelmsford Works of Messrs. Crompton Parkinson, Ltd., were held at the Wood Street ground last Saturday. The weather was good, with the exception of one or two showers, and there was a large attendance. Over 1,100 entries—50 per cent. more than last year—were received for the numerous events. The Hardie Departmental Cup was won by the Apprentices for the fourth year in succession, while the Ladies' Cup presented by Mrs. Hardie was won by the Office team. Individual cups were won jointly in the case of the Overseas Cup for men by Messrs. S. J. Hinton and E. J. Parrish, and by Miss M. A. Shipstone for the second year in the case of the cup presented by the Society of Essex Archers. The prizes were presented by Mrs. Holroyde.

To-morrow the annual sports meeting of the Clesco Sports and Social Club will be held at its sports ground at Raynes Park.

The Lancashire v. Yorkshire (Power Companies) cricket match in progress and the two teams

Mr. W. Moody, captain of the Yorkshire team, is fourth from the left; the next in order are Messrs. S. R. Siviour, C. D. Taite, R. W. Pennington (Burgess, Ledward), and S. D. Larcombe, captain of the Lancashire team.

Recent Contracts

An order has been recently placed by the Orient Steam Navigation Co. for the equipment of six of its liners with the "Magnet" fire alarm system, which is primarily designed to transmit instantaneous warning to the bridge from any quarter of the ship in which fire has broken out. Each vessel will have a 20-way fire alarm indicator for installation in the wheelhouse, sixteen glass-fronted locking pushes for placing in convenient positions throughout the vessel, and sixteen watertight bells with chromium-plated gongs for installation in crews' and passenger accommodation, engine room, &c. The 20-way indicator accommodates two hand combination telephones, while each way of the indicator and each alarm push is equipped with a socket for plugging in these telephones. The person giving an alarm breaks the glass of the alarm push nearest to the outbreak, and depresses the push button which is automatically locked down. The corresponding lamp at the indicator is then lighted and relays are energised which operate the alarm bell in the wheelhouse. The officer on watch then despatches to the call point a man with a telephone which he plugs into the socket in the push, gives information regarding the outbreak, and then, if necessary, switches on the alarm bells throughout the ship.

A neat loud-speaker van belonging to the Autocar Radio Service

New Catalogues and Lists

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Publications dealing with class "B" driver transformers, type "CH.4" chokes, differential and reaction condensers, button-hole transverse current microphones and midget single pole single- and double-throw switches.

Wego Condenser Co., Ltd., Perivale, Greenford, Middlesex.—An illustrated price list of condensers.

M.K. Electric, Ltd., Wakefield Street, Edmonton, N.18.—A leaflet announcing a reduction in the prices of surface switch plugs.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlet No. K.81/5, relating to h.p. metal-clad oil-break switchgear.

Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—The June issue of the "Wigan Review," containing notes about electric signalling systems for mines, &c.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1—The June stock list of motors, generators, centrifugal pumps, &c. Also a catalogue (No. 1,350) of wires and cables.

British Driver-Harris Co., Ltd., Gaythorn Mill, Albion Street, Manchester.—A leaflet announcing the production of the new "Nichrome V" heating element materials.

Bruce Peebles & Co., Ltd., Edinburgh.—A 64-page booklet (No. 711A) dealing with power transformers.

Schall & Son, Ltd., 75, New Cavendish Street, W.1.—An illustrated catalogue of X-ray accessories.

Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.4.—A leaflet giving details of a new range of "Neco" ¼-, ½-, and ¾-h.p., 1,400-r.p.m. repulsion start induction motors.

Sir W. G. Armstrong-Whitworth & Co. (Engineers), Ltd., Scotswood Works, Newcastle-upon-Tyne.—An illustrated brochure (No. 596) on Diesel shunting locomotives.

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.2.—An illustrated catalogue (Section D.4) of electric fans.

Berkeley & Young, Ltd., Tyseley, Birmingham.—List No. E.F.10/33, dealing with exhaust fans.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—A leaflet illustrating and describing additions to the company's range of lighting fittings.

Northern Steel & Hardware Co., Ltd., 1 & 3, Southgate, Deansgate, Manchester.—An abridged price list (No. 12) of electrical and wiring sundries.

Bowen Instrument Co., 196, Chapeltown Road, Leeds.—A folder describing the "Impressor" hardness testing machine.

Measurement, Ltd., Terminal House, Lower Belgrave Street, Victoria, S.W.1.—A pamphlet illustrating and describing a new overload pattern type "Z" watt-hour meter.

Simplex Electric Co., Ltd., 159, Great Charles Street, Birmingham.—Three publications dealing with immersion heaters, storage water heaters, and switch- and fuse-gear.

Bruce, Dawson & Co. (London), Ltd., 55, Radcliffe Road, Winchmore Hill, N.21.—A leaflet relating to all-metal dolly trucks.

Company Liquidations

Mur-Ray Signs, Ltd., 11, Ladybarn Road, Fallowfield, Manchester.—At the meeting of creditors held at the company's offices recently, it was reported that resolutions for voluntary liquidation had been passed and Mr. Parker, of Messrs. Parker, Gradwell & Co., Manchester, and Mr. Bowers, the secretary of the company, had been nominated as joint liquidators. The statement of affairs showed ranking liabilities of £3,309, of which £1,309 was due to the trade, and £2,000 was owing to

Neolight Signs Co., Ltd., in respect of the balance of the purchase price. The assets were estimated to realise £3,292. After allowing £204 for preferential claims, the net assets were £3,088, leaving a deficiency so far as the creditors were concerned of £221. The creditors decided to confirm the appointment of the liquidators already nominated. A committee was also elected, consisting of the chairman of the company and the representatives of the Solus Electrical Co., and Harry L. Price & Co.

Junit Manufacturing Co., Ltd., manufacturers of radio components and electric clocks, Steele Road, London, W.4.—The statutory meeting of creditors was held on June 12th, at Norfolk House, Norfolk Street, W.C.2, when one of the directors occupied the chair. The statement of affairs showed liabilities of £3,256 and net assets of £258, leaving a deficiency of £2,998. A resolution was passed confirming the voluntary liquidation of the company with Mr. Nathan, Norfolk House, Norfolk Street, W.C., as liquidator. A committee was also appointed consisting of Mr. C. Latham, and the representatives of the Brownie Wireless Co., Ltd., and the L.M.K. Manufacturing Co.

Patricks Radio, Ltd., Manchester.—At the statutory meeting of creditors Mr. P. S. B. Webb, one of the directors, occupied the chair. The statement of affairs showed ranking liabilities of £487, and there was also a fully secured creditor for £10. After allowing £120 for preferential claims, the net assets were £67, leaving a deficiency of £420, so far as the creditors were concerned. The issued capital of the company was £100, and the deficiency as regarded the shareholders was £520. There was not a quorum of creditors present and it was stated that the voluntary liquidation would be continued with Mr. Escourt as liquidator. A committee was also appointed, consisting of the representatives of Messrs. W. E. Beardsall & Co., Ltd., and Messrs. Harry L. Price & Co.

Western Wireless & Electrical Co. (Salisbury), Ltd.—Meetings, July 17th, at Crown Chambers, Salisbury, to receive an account of the winding-up by the liquidator, Mr. J. R. Layton.

A part of the exhibition of new season's Ferranti products which is being held at Bush House, Aldwych, this week. The display consists of fires, radio receivers and clocks, while a voltage regulator and a working model of a surge absorber can also be seen in the meter department

Bagdad Tramways & Electric Lighting Syndicate, Ltd.—Meeting, July 15th, at 117, Rue de Stassart, Brussels, to receive an account of the winding-up by the liquidator, Mr. A. Reculez.

Electrical Name & Numerical Sign Co., Ltd.—Meeting, July 10th, at Watergate House, Adelphi, W.C., to receive an account of the winding-up by the liquidator, Mr. E. G. F. Cartwright.

Walsall Electrical Co., Ltd. (old company).—Second dividend of 6s. 8d. in the £. Liquidator, Mr. R. Cozens, Midland Bank Chambers, Bridge Street, Walsall.

Neolight Signs Co., Ltd.—Winding up voluntarily. Joint liquidators, Mr. P. C. Parker, 64a, Bridge Street, Manchester, and Mr. P. E. Bower, 37, Brown Street, Manchester.

Central Wholesale Electrical Co., Ltd.—Particulars of claims by June 30th to the liquidator, Mr. J. J. Baker, Eldon Street House, Eldon Street, E.C.

Hammond Bros. & Champness, Ltd.—Meetings July 17th at 104, High Holborn, W.C., to receive an account of the winding up by the liquidator, Mr. A. E. Quaife.

Bankruptcy Proceedings

B. Roberts, electrical engineer (trading as the Auto Electrical Co.), Tymawr Street, Aberavon, Port Talbot.—The public examination was held on June 12th at the County Court, Neath, when debtor said that his failure was due to keen competition, local trade depression, and taking over an unsound business from a partnership. His statement of affairs showed gross liabilities of £324, with ranking liabilities of £312, and a deficiency of £240. The examination was adjourned.

F. H. Hancock, battery and wireless dealer, 20, Fisherton Street, Salisbury.—The first meeting of creditors was held recently at the Official Receiver's Office, 12, Rolleston Street, Salisbury. Debtor had returned gross liabilities of £910, of which £884 was expected to rank for dividend. The assets were estimated to realise £36, so that there was a deficiency of £848. The failure was attributed to illness and general trade depression. The case being a summary one was left in the hands of the Official Receiver, as trustee.

A. M. Gibson and **W. R. F. Gibson** (trading as Gibsons Wireless), radio specialists, 94, Tavistock Road, Plymouth, and at Exmouth, and Teignmouth.—The public examination was held at the Western Law Courts, Plymouth. The joint statement of affairs lodged showed liabilities of £2,315, and an estimated deficiency of £1,613. The separate estate of A. Gibson disclosed liabilities of £282, with a deficiency of £185, while that of W. R. Gibson showed ranking liabilities of £134, and a deficiency of £130. It was stated that the trading had been difficult owing to competition from price cutters. The examination was adjourned.

E. Whitehouse, electrical and radio engineer, 29, Westfield Street, St. Helens, Lancs.—The public examination was resumed recently at the Court House, Liverpool. The statement of affairs lodged disclosed unsecured liabilities of £2,241, with assets of £517. Debtor attributed his failure to lack of capital and heavy overhead charges. The examination was concluded.

The Metropolitan-Vickers Electrical Co., Ltd., have staged this scale model of a typical grid sub-station in one of its windows at Crown House, Aldwych

H. A. Langlois (trading as the Electrical Installation Co. and/or the Electrical Contracting Co.), electrical contractors, 2, Atlas Place, Cardiff, and at Leicester.—The public examination was resumed recently at the Law Courts, Cathays Park, Cardiff. Replying to the Deputy Official Receiver, debtor said that he was unable to explain the disposal of over £5,000 over a period of fifteen months. He added that he had kept two banking accounts in Cardiff under different names, but both those accounts were now closed. There were no records kept in connection with the Cardiff business, and the books relating to the Leicester shops were incomplete. The examination was closed subject to the signing of the notes.

A. Peat, electrical engineer, White Hart Street, Mansfield.—First and final dividend of 6¾d. in the £, payable June 23rd at the Official Receiver's office, 22, Regent Street, Park Row, Nottingham.

I. L. Lawrence, electrician, 11, Grand Parade, Brighton, Sussex, late 111, Portland Road, Hove, Sussex.—The public examination took place at the Court House, Brighton, on June 14th. A deficiency of £368 had been returned. The failure was ascribed to bad trade, heavy overhead expenses, and lack of capital. The examination was closed.

C. G. Lowe (Tele-Radio & Electrical Supplies), radio and electrical dealer, 132, Burton Road, West Didsbury, Manchester.—Receiving order made June 12th on debtor's own petition.

G. H. Shindler (Scientific Electric Illuminating Co.), electrical engineer, 14, Craighall Avenue, Levenshulme, Manchester.—Receiving order made June 13th on debtor's own petition.

S. Gillitt (G. E. T. Electrical Supplies, Co.), electrical goods dealer, Lansdowne, Offerton Lane, Offerton, near Stockport.—Discharge suspended for three years until May 16th, 1936.

A. E. Bowen, electrical engineer, 103, Market Street, Dalton-in-Furness.—Last day for receiving proofs for dividend June 30th. Trustee, Mr. W. G. Pearson, 16, Cornwallis Street, Barrow-in-Furness, Official Receiver.

L. E. Hember, electrical engineer, 4, Pepper Street, Lymm.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, released May 3rd.

F. M. Clarke, electrical engineer, 3, Joyce Avenue, Sherwood, Nottingham.—Receiving order made June 9th on a creditor's petition.

W. M. Horsfall, electrical engineer, 7, Redcross Street, Liverpool.—Last day for receiving proofs for dividend June 24th. Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool.

The joint stand of the Shropshire, Worcestershire & Staffordshire Co. and the South Wales Electric Power Co. at the recent Three Counties Show, Worcester

Electricity Supply

Lighting, Domestic, Power

Acton.—WIRING OF HOUSING ESTATE.—Sanction has been received from the Ministry of Health to the borrowing of £2,800 for wiring houses on the Corporation estate.

Batley.—NEW TWO-PART TARIFF.—A new two-part domestic tariff has been introduced with a fixed charge of 15 per cent. of the rateable value of the premises supplied up to a rateable value of £50 and 10 per cent. on values above £50 (minimum fixed charge £2 5s. per annum), plus ¾d. per kWh consumed (minimum quarterly consumption 150 kWh).

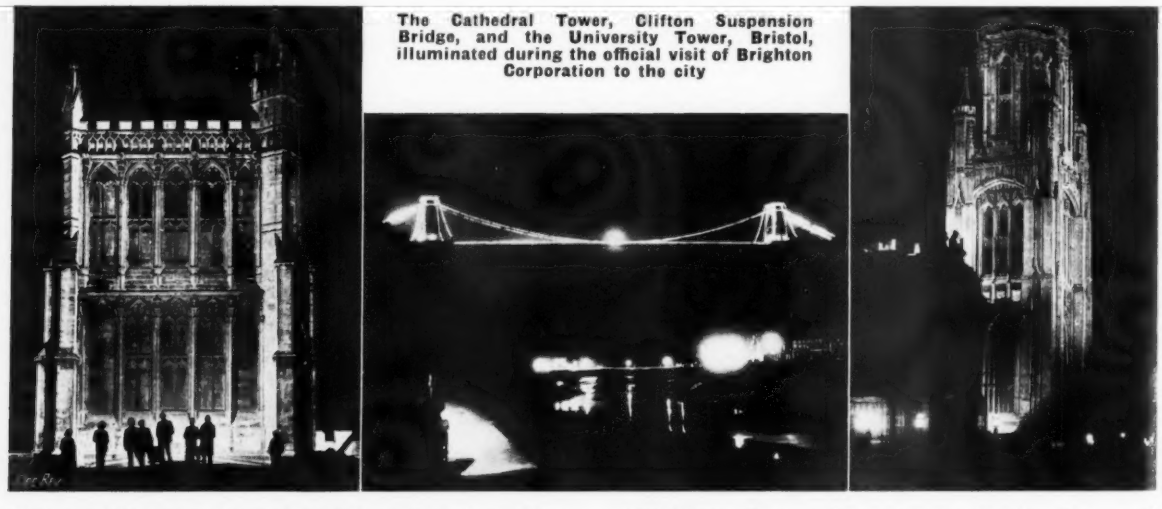
Bedford.—SUCCESS OF RURAL DEMONSTRATION SCHEME.—At a recent meeting of the Electricity Committee it was reported that five of the Development Commissioners, accompanied by their secretary and a member of the Electricity Commission, had inspected the works carried out by the Corporation in the rural demonstration area and typical premises supplied with electricity. The Commissioners expressed themselves fully satisfied with the manner in which the scheme had been carried out, and desired that the area should be surveyed and a report prepared by experts from the Department of Agriculture of one of the universities. The Committee recommends obtaining such a report from the director of the Institute for Research in Agricultural Engineering, Oxford University.

REDUCED DOMESTIC CHARGES.—The Electricity Committee recommends that for electricity consumed for domestic purposes during the winter quarters the "low rates" should be reduced by ¼d. per kWh to ½d. per kWh in Zone 1, and to ¾d. per kWh in Zones 2 and 3.

EXTENSIONS.—The Electricity Committee has received sanction to the borrowing of £1,008 for mains and £125 for substation equipment, and recommends the extension of mains to supply West End, Haynes, and Limbersley Lane, Maulden, and elsewhere at an estimated cost of £6,121.

Bideford.—EXTENSION SCHEME.—The Bideford and District Electric Supply Co., Ltd, has commenced an extension scheme, costing £4,000, to supply Bickington, Fremington, and district. A supply will be available in about five months, the charges being 10d. per kWh for lighting, 4d. for other purposes, and a two-part tariff with a "unit" charge of 1¾d.

Bristol.—ELECTRICAL ILLUMINATIONS.—In connection with the Bristol-Brighton Alliance which is operating from June 17th to June 24th the principal attraction from a sightseer's point of view is undoubtedly the illumination of some of the notable buildings in the ancient city. The coloured floodlighting of the Cabot Tower, Victoria Rooms, and the Cathedral are very



The Cathedral Tower, Clifton Suspension Bridge, and the University Tower, Bristol, illuminated during the official visit of Brighton Corporation to the city

effective, whilst the outlining of the Clifton Suspension Bridge with red and white incandescent lamps provides an exquisite setting to the Avon Gorge. Numerous commercial houses have entered into the spirit of making Bristol a city of light, and the Bristol Tramways Co., the Co-operative Wholesale Society, and the Bristol Motor Co. (to mention only a few) have effectively illuminated their premises. The energy for all floodlighting undertaken by the Bristol Development Board is being supplied free of cost by the Bristol Corporation and the North Somerset Electric Supply Co., and the electrical arrangements were made by the Ediswan Co. (Mr. J. Lovell), Messrs. J. H. Winter & Co., Messrs. Porter & Co., and Messrs. Rouch and Penny.

Carlisle.—MAINS EXTENSIONS.—The City Council is to extend mains in the Carlisle area (£839), and in the rural areas (£1,551).

ASSISTED WIRING.—With a view to expediting electrical development, the Finance, Gas, and Electricity Committees have been requested to consider the advisability of increasing the number of houses to be supplied with electricity under the assisted wiring scheme.

YEAR'S WORKING.—The net profit of the Electricity Department for the past year was £4,786, as against £6,886 in the previous year. Reduced charges made during the year represent concessions to consumers totalling £7,000.

Chester.—NEW ELECTRICAL BYLAWS.—The City Council has submitted to the Electricity Commissioners for confirmation certain bylaws relating to electric wires, apparatus and fittings.

Clacton-on-Sea.—SUPPLY TO JAYWICK LANE.—The Urban District Council has applied for sanction to a loan of £1,000 for mains and plant for supplying electricity to premises in Jaywick Lane.

Colchester.—REVISED CHARGES.—The City Council has adopted the following revised scale of electricity charges:—Lighting, first 50 kWh in each winter quarter, Colchester, 6d. per kWh, extended area 8d. per kWh; over 50 kWh in each winter quarter 5½d. and 7½d. respectively. Power, heating and cooking supplies (Colchester), not exceeding 150 kWh per quarter, 2½d.; exceeding 150 kWh up to 1,000 kWh per quarter, 1½d.; exceeding 1,000 kWh up to 2,000 kWh, 1¼d.; beyond 2,000 kWh, 1d. Power, heating and cooking (extended area), the same as in Colchester plus 15 per cent.

Crediton.—SUPPLY DELAYS.—The Rural District Council has complained to the Electricity Commissioners of delay in affording a supply of electricity in its district. The Exe Valley Electricity Co., Ltd., has informed the Council that it will be supplying Newton St. Cyres in the summer.

Dartford.—MAINS EXTENSIONS.—The Urban District Council proposes to extend mains at a cost of £2,943, including £1,994 to supply Bexley Mental Hospital.

REDUCED COOKING CHARGES.—A reduction in the cooking charge to ¾d. per kWh is recommended.

Dorchester.—CHEAPER ELECTRICITY.—The Lighting Committee recommends a reduction in the "unit" charge of the domestic tariff, from 1d. to ¾d.

Dorking & Horley.—OVERHEAD LINES.—The Rural District Council has decided to offer no objection to the use of overhead lines for the supply of electricity at Capel, Holmwood, Leigh, Newdigate, Parkgate, Ockley, and Oakwood Hill by the London & Home Counties Joint Electricity Authority.

Ealing.—ELECTRICITY FOR CHLORIDE DEPOT.—In reply to an application from the Chloride Electrical Storage Co., Ltd., for a d.c. supply for a proposed battery charging depôt, the Council has offered a supply at the all-in rate for factory and workshop purposes. Supplies are also to be afforded to "Woodlands," the premises of the London Co-operative Society at South Ealing, and the new Luxor Cinema.

Eastbourne.—JUBILEE ILLUMINATIONS.—During last week Eastbourne celebrated the jubilee of its incorporation, and a feature of the festivities was a special scheme of illuminations, arranged by the Illuminations Committee in conjunction with the Corporation Electricity Department. The existing lighting of the Grand Parade was augmented by nearly 2,000 pink and green lamps, while the Town Hall tower and many of the hotels were floodlighted.

Eccles.—EXTENSIONS.—The Electricity Committee is to provide a supply of electricity to the works of Messrs. E. Taylor, Ltd., in Monton Fields Road, Monton (£217), and to premises in Peel Green Road (£154).

Errol.—BRIGHTER PROSPECTS FOR SUPPLY.—The Grampian Electricity Supply Co. has been offered an alternative route for bringing electricity into Errol, where houses have been wired for two years awaiting supplies. The delay has been due to a difference between the company and a farmer over compensation for a wayleave, but a settlement is now expected.

Farnborough.—OVERHEAD LINE INQUIRY RESULT.—As an outcome of a recent inquiry the Ministry of Transport has allowed the appeal of the Mid Southern Utility Co., Ltd., for permission to construct overhead lines in Prospect Road.

Farnham.—SUPPLY FOR INSTITUTION.—The Surrey County Council Health Committee has decided against installing generating plant at the Farnham Institution, and has accepted the Farnham Gas and Electricity Co.'s terms for an electricity supply.

Festiniog.—SPECIAL ORDER.—The Yale Electric Power Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the urban district of Festiniog.

Herne Bay.—LIGHTING OF PIER.—The Urban District Council has received the consent of the Ministry of Transport to having the pier lighted by electricity, and the work is to be put in hand as soon as tenders are received and decided upon.

Ipswich.—HEATING OF CORN EXCHANGE.—The Estate Committee recommends the installation of electric heating apparatus costing £242 at the Corn Exchange.

YEAR'S WORKING.—The Electricity Committee reports a net surplus of £22,272 for the past year.

POWER STATION EXTENSIONS.—Further cubicle extensions are to be provided at the power station at a cost of £650.

Kent.—RURAL SUPPLIES IN THE AUTUMN.—In order to facilitate the progress of the rural electricity scheme by the Kent Electric Power Co., the Hollingbourne Rural District Council has decided to approve the use of overhead lines from Gore Court, Sittingbourne, to Milsted, Doddington, Lenham, Harrietsham, Broomfield, and Langley Heath, with a branch line to supply Leeds, Otham, and Langley. It is hoped to have a supply available in most of these parishes during the coming autumn.

King's Lynn.—SPECIAL ORDER.—The Town Council proposes to apply to the Electricity Commissioners for a Special Order authorising it to supply electricity in the parishes of Clenchwarton, Terrington St. Clement, Terrington St. John, Tilney All Saints, Tilney-cum-Islington, Tilney St. Lawrance, Walpole St. Andrew, Walpole St. Peter, West Walton, parts of Emneth and Walsoken, Wiggenhall St. Germans, Wiggenhall St. Mary the Virgin, Wiggenhall St. Peter, and North Lynn.

Kirkcudbright.—NEW ELECTRICITY REGULATIONS.—New tariff leaflets have been circulated in Kirkcudbright, and wiring may have to be altered as the previous system did not differentiate between lighting and power. A consumers' association has been formed.

Lichfield.—OVERHEAD LINES.—The Rural District Council has consented to the City Council carrying an overhead line from Aldridge to Litchfield, *via* Stonnall and Wall.

EXTENSIONS.—E.h.p. mains are to be laid to Trent Valley to supply the maltings of Messrs. J. & C. Evans & Co., at a cost of £1,653, including sub-station transforming plant, switchgear, and distribution cables at Streethay.

Lincolnshire.—RURAL ELECTRIFICATION.—The Mid Lincolnshire Electric Supply Co., Ltd., has commenced supplying the villages of Manthorpe and Great Gonerby in the Grantham area, and extensions will be completed in a month at Bottesford and Sedgebrook. Later the mains will be extended to Redmile, Barkestone, Plungar and Harby, and to the district between Grantham and Long Clawson.

Llandrindod Wells.—PROPOSED SALE OF UNDERTAKING.—The Urban District Council is to call a public meeting to afford ratepayers an opportunity of expressing their views with regard to the sale of the electricity undertaking to the Shropshire, Staffordshire & Worcestershire Electricity Supply Co.

London.—SOUTHWARK.—The Electricity Committee has voted the following estimates for works to be carried out during the year: Additional feeder to Kennington, £1,300; additional mains, &c., £2,000; meters, £3,000; services, £2,500.

The charge for electricity for staircase lighting in tenement dwellings is to be reduced to 3d. per kWh in cases where the Council provides the wiring free of cost to the consumers, and to 2½d. per kWh in other cases.

BATTERSEA.—The Electricity Committee proposes to erect a sub-station at Grayshott Road (£900), to provide electricity services to 124 premises (£1,115), and to extend mains to Durham Buildings, York Road (£303).

Lossiemouth.—CHEAPER ELECTRICITY.—The Town Council is to reduce the price of electricity from 8½d. to 7½d. per kWh for lighting purposes, from 1½d. to 1d. for heating and cooking, and from 3½d. to 3d. for power.

Manchester.—PROGRESS IN APRIL.—The Electricity Department reports an increase of 1,632 kW in connections during April, making a total of 531,506 kW, while applications for supplies (including additional supplies) numbered 1,784, representing 3,167 kW. There were 171 new cookers connected, making a total of 11,314 on circuit; orders for the hire of cookers amounted to 157. Hired wash-boilers on circuit numbered 435, of which sixteen were connected during the month.

Midlands.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Midland Electric Corporation for Power Distribution, Ltd., to supply electricity in portions of the counties of Stafford, Worcester and Salop, and providing for the suspension of powers of purchase of existing undertakings.

Motherwell.—STREET LIGHTING CHANGE-OVER.—Following reports submitted by the gas engineer, Mr. Alexr. Macdonald, and the electrical engineer, Mr. W. D. Brassington, it was resolved at a recent meeting of the Town Council to change over from gas to electricity the existing 286 back court and 105 side street lamps in the Wishaw area. There will then be electric lighting in all the main streets, side streets, and back courts throughout the burgh.

Northamptonshire.—CHEAPER ELECTRICITY.—Reduced charges are announced by the Northampton Electric Light & Power Co., Ltd., the Wellingborough Electric Supply Co., Ltd., and the Rushden & District Electric Supply Co., Ltd.

Paisley.—HIRED WIRING INSTALLATIONS.—The question of hired wiring installations has been again under review by the Electricity Committee, which has agreed to recommend that a period of ten years during which rent should be charged be adhered to. At the end of this period the Corporation will no longer be responsible for the upkeep of the installation.

Penclawdd (near Swansea).—SUPPLY INAUGURATED.—An electricity supply was inaugurated last Friday, though the formal opening will not take place for a week or two.

Plymouth.—HOE FLOODLIGHTING SCHEME.—The Plymouth Hoe and Parks Committee has adopted a scheme costing £330 for the summer illumination and floodlighting of the Hoe.

Richmond (Surrey).—CHEAPER ELECTRICITY.—The Richmond (Surrey) Electric Light & Power Co., Ltd., announces reductions in the "unit" charge of the all-in rate from ¾d. to ½d. for the two summer quarters, and in the flat rate for lighting for the whole year, from 5½d. to 5d. per kWh. Cookers and water heaters may now be hired, an electric kettle and two special saucepans being supplied on free loan with cookers obtained from the company under this scheme.

Scarborough.—NEW FEEDER.—The Electricity Committee has obtained sanction to a loan of £3,180 for a new feeder cable.

EXTENSION SCHEME DEFERRED.—Consideration of a scheme to supply Wykeham and Ruston has been deferred.

BULK SUPPLY.—The Town Council has interviewed the Central Electricity Board on the question of taking a bulk supply from the Board.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £9,000.

Sleaford.—NEW WIRING REGULATION.—The Electricity Committee has notified local contractors that it will not connect up installations in which split tubing has been used, and that all tubing and lead covering of cable must be bonded together throughout and earthed.

South Africa.—ELECTRICAL DEVELOPMENT AT JOHANNESBURG.—Of the recent £1,000,000 Johannesburg municipal loan it is proposed to allocate £20,000 for electrical development and £66,896 for tramway works.

South Shields.—ELECTRICITY FOR CINEMA PROJECTORS.—The charge for electricity for motor-generator sets for cinematograph projectors is to be reduced from 3½d. to 2½d. per kWh.

Stratford-on-Avon.—HOUSE INSTALLATIONS.—The Rural District Council has decided to have electric lighting installed in twenty-nine houses at Henley-in-Arden.

Ulverston.—LOAN.—The Urban District Council has applied for sanction to a loan of £1,300 for meters, motors and apparatus.

Uttoxeter.—NEW SUB-STATIONS.—The Urban District Council has approved the expenditure of £3,639 on sub-stations and £298 on installations for new street lamps.

Wakefield.—LOANS SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £5,000 for meters and £8,000 for extensions to e.h.p. mains.

Walsall.—YEAR'S WORKING.—The profits of the Electric Supply Department amounted last year to £22,022, as compared with £19,840 in 1931. Electricity sold shows an increase of 1,687,220 kWh.

Wem (Salop).—INAUGURATION OF SUPPLY.—On Thursday last week the electricity supply provided by the North Wales Power Co. was switched on by Mr. W. Bowen, chairman of the Urban District Council, who was supported by members of various bodies and representatives of the company, including Mr. G. T. Paton, area manager. The supply also extends to Prees and Tilstock.

Whitby.—NEW HEATING TARIFF.—The Urban District Council has adopted a tariff of ½d. per kWh for heating for consumers with loads of 50 kWh or over, this to apply to the two summer quarters only, with restricted hours for winter consumption.

COOKER HIRING.—The present system of hiring cookers is to be discontinued, except in the case of used models, hire-purchase terms being available in respect of new models.

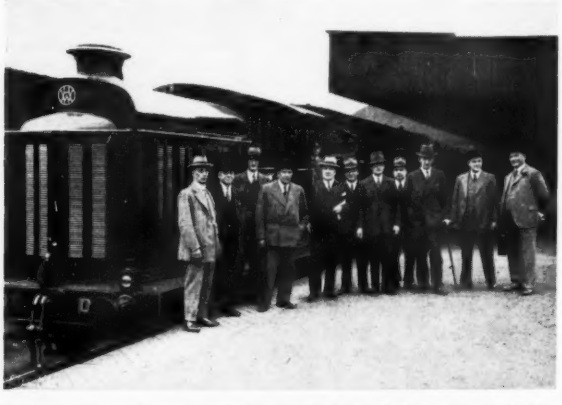
Whitehaven.—POWER CHARGES.—The Town Council has decided that the charge to power consumers in excess of 12,000 kWh per month shall be reduced from 1d. to 0.9d. per kWh, but this is not to apply in any case where any part of the supply is consumed on the peak load during the months of January, February, November, and December.

Wrotham.—APPLICATIONS FOR SUPPLIES.—The Urban District Council has forwarded to the Kent Electric Power Co., Ltd., a petition received from fifty-six householders at Plaxtol and the vicinity asking for electricity supplies.

Traction

Australia.—AN ELECTRIC LOCOMOTIVE.—The Victorian Minister in charge of electrical undertakings, Mr. Macfarlan, has refused to sanction the purchase, recommended by the State Electricity Commission, of a German electric locomotive for use at Yallourn until he is convinced that it cannot be obtained in Great Britain or made in Australia. When the Commission called for tenders two were received from British firms and two from German makers, and none from Australia. The Commission, in recommending the lower of the German tenders at £8,042, said it was £2,400 less than the British offers. The Premier, Sir Stanley Argyle, has announced that full inquiries will be made to ascertain whether an electric locomotive can be made in Australia at a price reasonably comparable with the lower of the two German quotations.

Belgium.—RAILWAY ELECTRIFICATION.—The question of electrifying the railway between Brussels and Antwerp is stated to have now been solved, as the directors of the National Railways Company have decided to proceed with the work at an estimated expenditure of 118 million fr. The technical departments of various electrical financing companies are engaged on the preparation of the estimates, and it is considered probable that foreign firms will also be permitted to participate in the public tendering, which is shortly to take place.



Ulster rail and road transport officials photographed before going for a trial run on the Diesel rail coach built by Messrs. Harland & Wolff, Ltd., to the order of the Belfast and County Down Railway

Blackpool.—A NEW TRAMCAR.—A tramcar designed by Mr. W. Luff, Blackpool's new transport manager, and built at Preston, is intended for service on the Fleetwood route. It is streamlined, and capable of a speed of 40 m.p.h. It has a sliding roof, and will be electrically heated in winter.

France.—PARIS SUBURBAN ELECTRIFICATION.—The Minister of the Seine Department has authorised the floating of a loan of 120,000,000 fr. for the electrification of the Sceaux line, which, together with the Massy, Luxembourg, and Denfert lines, has been transferred from the Paris-Orleans Railway to the Seine Department. Thirty electric motor coaches and twenty-seven trailers are to be built for passenger traffic.

London.—TRAMWAY BREAKDOWN.—The breakdown of the supply of electricity to the L.C.C. tramway system at 10.12 p.m. on Sunday was due to the electrical disturbance at Greenwich power station that followed the failure of an automatic voltage regulator controlling one of the large alternators running on the bars at the time. The minimum period of delay was twenty minutes, the maximum fifty minutes, and 850 cars were affected.

SOUTHWARK.—The Highways Committee is to install traffic signals in Southwark Bridge Road at a cost of £845.

SHOREDITCH.—The Highways and Works Committee recommends the installation of traffic-actuated control signals at the junction of Queen's Road with Shrubland Road and Livermere Road.

Northern Ireland.—THE BELFAST TRAMS.—The total number of passengers carried on the Belfast Corporation tramways during the past year was 105,237,280, a decrease of nearly 7,000,000 as compared with the previous year. The total receipts (£545,279) were £38,206 lower, and the working expenses declined by about £16,000.

Russia.—ELECTRIFICATION PROJECTS.—The second Five-Year Plan covers the electrification of about 13,900 miles of route, 85 per cent. being main lines and 6 per cent. suburban lines. Among the most important conversions are the Moscow-Nijni Novgorod-Ural, Moscow-Kharkov, and Omsk-Novosibirsk sections, and when the Plan is completed 21 per cent. of the total Soviet mileage will have been electrified. Conversion work has already commenced on 700 miles of line.

Wrexham.—TRAFFIC SIGNALS.—The Town Council has received sanction to the provision of traffic signals at the junction of Grosvenor Road and Rhosddu Road, but an application to install similar signals at the junction of Bradley Road has been refused.

Communications

Europe.—BROADCAST WAVELENGTHS.—After five weeks' deliberation at Lucerne, the Broadcasting Conference of European countries ended on June 19th. New wavelength allocations were accepted by twenty-seven countries, and seven others are expected to fall into line when the redistribution takes effect on January 15th, 1934. Great Britain will retain the present number of wavelengths, but they will be slightly shortened and several of them will be shared by distant countries.

France.—LISTENERS TO PAY.—The Paris correspondent of the *Wireless World* reports that the Chamber of Deputies and the Senate have voted in favour of broadcast receiving licences, 50 fr. to be payable annually on valve sets and 15 fr. on crystal sets.

Great Britain.—THE WESTERN REGIONAL TRANSMITTERS.—As there would appear to be some misunderstanding of the arrangements for introducing the alternative programme service from the West Regional station at Washford Cross, the B.B.C. states that the West Regional programme transmitter has been radiating a full service since May 28th, and the alternative programme service for South Wales and the West Country will be available when the West National programme transmitter (which will share the wavelength of 261.6 metres with the London National transmitter) comes into operation. The working of two high-power transmitters on the same wavelength is a new departure requiring extensive preliminary testing, and it is expected that the introduction of the full alternative programme service from the West Regional station will begin in July.

NO CHEAPER TELEPHONES.—In reply to a resolution passed by the Association of British Chambers of Commerce asking for lower telephone rentals, the Postmaster-General states that a reduction is not possible at the moment, as lowering the rentals to £1 would mean a loss of £3,000,000 a year to the Post Office.

RADIO RECEIVING LICENCES.—The number of broadcast radio receiving licences issued in May was 289,400, bringing the total in force up to 5,576,500.

RADIO RELAY SERVICES.—Subject to certain conditions, the Scarborough Town Council has consented to Wireless Relay Services, Ltd., establishing a relay system within the borough.

The Seaford Urban Council has declined to allow British Concessions to establish a service, which was opposed by local dealers.

The Whitehaven Town Council has refused to permit the establishment of a service in the borough.

The Ayrshire Electricity Board has objected to the use of overhead wires by Ayrshire Wireless Services, Ltd., at Darvel, and has asked the Town Council to withhold its consent to the establishment of a service. In consequence, the application has been deferred. The Cumnock Town Council has granted the firm permission in respect of that town subject to modified conditions. The Kilmarnock Town Council is recommended by its Streets Committee to grant permission to the company or a subsidiary to establish a relay service in the town.

The Wakefield Highways Committee has considered the use by the Wireless Relay Services, Ltd., of lighting standards in Dewsbury Road without the permission of the Corporation, and has requested the company to remove the attachments from the standards.

The Eastbourne Highways Committee has refused to grant permission to Morris Relay Services, Ltd., to establish a service in the borough.

The Rushden Urban Council is considering an application from Broadcast Listeners' Service, Ltd., for permission to establish a service. Local wireless dealers, in a protest, have informed the Council that if there was a demand for such a service they would be prepared to submit a scheme.

Italy.—RURAL BROADCASTING.—*World Radio's* Turin correspondent reports that a decree for the establishment of a Rural Broadcasting Organisation has been passed by the Italian Chamber of Deputies and has now been made law. The objects of the new society are twofold: to propagate in country districts by means of broadcasting culture in general, and rural instruction in particular. A very comprehensive committee, made up of members of the Government, of workers, of the trade, of representatives of the E.I.A.R., has been formed under this new law, and negotiations will be carried out with the trade in regard to the supply of the receiving sets required.

Switzerland.—BROADCASTING DURING 1932.—The second annual report of the Société Suisse de Radiodiffusion has been published. During 1932 the number of wireless licence-holders increased by 81,000, making a total of 231,397. Assuming an average of three persons to every set, the wireless audience in Switzerland is about 700,000, out of a population of 4,000,000. The Society had 1,500,000 fr. (approximately £60,000 at par) at its disposal during the year 1932, and for 1933 the amount has been increased to 2,000,000 fr. (approximately £80,000). A licence in Switzerland costs 15 fr., of which, during 1932, 7.32 fr. was retained by the Postal Administration to cover the maintenance and depreciation costs of the technical installations, administration expenses, etc. The balance was handed over to the broadcasting societies and their studios.—*World Radio.*

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—September 12th. Posts and Telegraphs Department. Automatic telephone switching equipment. (A.Y. 11848.)*

Batley.—June 26th. Town Council. Electric lighting installation for Public Health Department, Market Place. Electricity Department, George Street, Batley.

Belgium.—BRUSSELS.—July 1st. Société du Canal et des Installations Maritimes de Bruxelles, 50, Rue du Canal, Brussels. Six electrically operated capstans at the locks at Capelle-au-Bois, Willebroeck and Wintham. Particulars for sixty francs.

Croydon.—June 28th. Electricity Department. Motor-driven circulating water pump. (June 16th.)

Darlington.—July 10th. Corporation. Trolley vehicles. (See this issue.)

Dumfries.—June 27th. County Council. 500-kW rotary convertor, transformer and control gear. (June 9th.)

Dundee.—July 4th (extended from June 20th). Transport Department. Electro-thermal storage system for the heating and ventilation of the central transport depôt. (June 16th.)

East Lothian.—June 30th. County Council. Various works, including electric lighting, at housing schemes. County architect, Haddington.

Edinburgh.—June 26th. Corporation. Overhead and underground cables to the medical officer's house at Gogarburn, and also electric lighting installation in part of Gogarburn Institution. Mr. S. Kaye, 14, Hill Street, Edinburgh.

Fife.—June 26th. County Council. Various works, including electrical, at Leuchars housing scheme. Messrs. Maclennan & Cunningham, 1, Gregory Place, St. Andrews.

Gosport.—July 4th. Town Council. Electric lighting plant, oil engine, &c., at air-compressing station. Borough engineer, Town Hall (deposit £5 5s.).

Hipperholme (YORKS).—June 26th. West Riding Education Committee. Installation of lighting at Hipperholme Grammar School and headmaster's house. Education Officer, County Hall, Wakefield.

India.—SIMLA.—August 14th. Indian Stores Department. Electric lamps. (A.Y. 11853.)*

Letchworth.—June 26th. Urban District Council. Electrical installation at 235 houses. Surveyor, Council Offices, Broadway Chambers (deposit £3 3s.).

London.—OFFICE OF WORKS.—June 27th. Electrical accessories. (June 16th.)

Midlothian.—July 8th. County Council. Electrical installation at new school at East Calder. County architect, 10, Drumsheugh Gardens, Edinburgh.

New Zealand.—CHRISTCHURCH.—August 8th. Electricity Department. 11,000-V sub-station switchgear. (A.Y. 11841.)*

Paisley.—July 3rd. Corporation. Various works, including electric lighting, &c., for 354 houses. Master of Works' office, 16, Gilmour Street.

South Africa.—JOHANNESBURG.—July 15th. City Council. 2,000 street lamp fittings (open reflector type) and 1,000 spare holders. (G.X. 12651.)*

July 4th. 115-V, 25-W metallic filament traction lamps. (A.Y. 11842.)*

July 17th. South African Railways and Harbours. Electric lamps. (A.Y. 11833.)*

July 14th. Rand Water Board. 950-kW steam turbine-driven alternator set and switchgear. (A.Y. 11835.)*

PRETORIA.—June 30th. Government Supplies Board. Three-element high-frequency oscillograph. (A.Y. 11832.)*

DURBAN.—September 29th. Town Council. Twenty-two double-deck trolley-buses. Messrs. Webster, Steel & Co., 9, St. Helen's Place, Bishopsgate, E.C.3 (deposit £3 3s.).

July 14th. Telephone cables (A.Y. 11844)* and telephone wires and apparatus (A.Y. 11845.)*

Southend-on-Sea.—July 7th. Electricity Department. Uniform clothing. (See this issue.)

Upton (CHESHIRE).—July 10th. Mental Hospital Visiting Committee. Electric lighting and power equipment at the Mental Hospital. Messrs. Sloan & Lloyd Barnes, consulting engineers, 34, Castle Street, Liverpool (deposit £2 2s.).

Uruguay.—MONTEVIDEO.—July 25th. State Electricity Works. 17,700 single- and three-phase house service meters. (A.Y. 11822.)*

West Riding.—July 10th. Education Committee. Installation of electric lighting at Askern Moss Road new infants' school. Education officer, County Hall, Wakefield.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Australia.—Postmaster-General's Department. Accepted. Multiple twin cable.—W. T. Henley's Telegraph Works Co., Ltd. (£1,357); Noyes Bros. (Melbourne) Pty., Ltd. (£225). Lead-covered switchboard cable.—W. T. Henley's Telegraph Works Co., Ltd. (£1,925); British Insulated Cables, Ltd. (£945). Carrier maintenance parts.—Standard Telephones & Cables (Australasia), Ltd. (£8,694); British General Electric Co., Ltd. (£208). —*Tenders.*

Eastbourne.—Electricity Committee. Accepted. Switchgear for Polegate sub-station (£296).—Ferguson Pailin, Ltd.

Eccles.—Housing Committee. Accepted. Electric lighting installation at twenty council houses (£98).—A. Cunningham.

Government Contracts.—The following contracts were placed by the various Government departments during May:—

ADMIRALTY (CONTRACTS AND PURCHASE DEPARTMENT).

Motor alternators and generators.—Electric Construction Co.; Mawdsleys.
Electric cable.—G.E.C.
Electrically driven capstans.—Sir William Arrol & Co.
Condensers.—Dubilier Condenser Co.; Telegraph Condenser Co.
Interceptors.—Eversheds & Vignoles.
Panels, transmitters, &c.—Plessey Co.; Marconi's; H. W. Sullivan.
Switches, &c.—Engineering & Lighting Equipment Co.
Tuners, amplifiers, receivers, &c.—Radio Instruments; Gambrell Bros.; Marconi's; H. W. Sullivan.

WAR OFFICE.

Secondary batteries.—Pritchett & Gold.
Electric cable.—B. I. Cables; Johnson & Phillips.
Sheet copper.—B. I. Cables.
Motor directing switches.—Small Electric Motors.

AIR MINISTRY.

Accumulators.—Peto & Radford.
Electrical conduits and fittings.—G. E. C.
Transmitter and receiver.—Gramophone Co.
W/t. valves.—G.E.C.
W/t. equipment (controllers and spares).—Siemens Bros.

CROWN AGENTS FOR THE COLONIES.

Electrification of cranes.—H. Morris, Ltd.
Engine spares.—Mirrlees, Bickerton & Day.
Generating set.—Bellis & Morcom.
Lifts.—Marryat & Scott.
Meters.—Ferranti.
Telephones.—G.E.C.
Telephone equipment.—International Automatic Telephone Co.
Wireless materials.—Standard Telephones.
X-ray equipment.—A. E. Dean & Co.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; Ericsson Telephones; G.E.C.; Phœnix Telephone & Elec. Works.
Testing and protective apparatus.—Phœnix Telephone & Elec. Works.
Cable.—B. I. Cables; Connollys; Enfield Cable Works; G.E.C.; W. T. Glover; Hackbridge Cable Co.; Henley's; Macintosh Cable Co.
Submarine cable.—Telegraph Construction & Maintenance Co.
Vacuum cleaners.—British Vacuum Cleaner & Engineering Co.
Loading coils.—Siemens Bros.; Standard Telephones.
Telephone cords.—Phœnix Telephone & Elec. Works; Reliance Elecl. Wire Co.
Dynamotors.—Dynamo & Motor Repairs.
Power equipments.—Power Equipment Co.
Electric lighting fittings.—Eureka Conduits & Fittings Co.
Recoating cases with ebonite.—Siemens Electric Lamps & Supplies.
Thermionic valves.—Standard Telephones.
Flameproof wire.—London Electric Wire Co. & Smiths.
Submarine cable, Lumps Fort, Nettlestone Point (I. of W.).—Siemens Bros.
Cabling, loading coils and terminations.—Carmarthen-Tenby-Milford Haven (Carmarthen-Narbeth section): Pirelli-General.
Electric lifts (provision of new brakes and controllers).—Edinburgh: A. & P. Steven.

Telephone exchange equipment.—Caversham (Reading): Standard Telephones. Sub-contractors: Chloride Elecl. Storage Co. for batteries; Electric Construction Co. for generators and ringing machines. Reading: Standard Telephones. Sub-contractors: Chloride Elecl. Storage Co. for batteries; Electric Construction Co. for generators; W. Jones & Co. for ringing machines. Southend-on-Sea. Macclesfield: Standard Telephones. Chatham, Colwyn Bay, Hereford, Kirkcaldy, Brighton, Iver (Bucks): Siemens Bros. Preston: G.E.C. Springpark (West Wickham, Kent): Ericsson Telephones. Sub-contractors: Pritchett & Gold for batteries; Electric Construction Co. for generators.
Telephonic repeater equipment.—Derby, Manchester, Leeds, Fenny Stratford: Standard Telephones. Leicester: G.E.C.
Voice frequency telegraph apparatus.—Glasgow, Belfast, G.P.O. (West), E.C.: Standard Telephones.

H M. OFFICE OF WORKS.

N.P.L., William Froude Laboratory. Motors and control gear for propeller tunnel.—G.E.C.

Gravesend.—Watch Committee. Accepted. Illuminated traffic signs (£123).—Brighton Lighting & Electrical Engineering Co., Ltd. Cast-iron signs with reflex lenses (£119).—Revo Electric Co., Ltd.

Ipswich.—Transport Committee. Accepted. Four trolley vehicles (£1,734 each).—Ransomes, Sims & Jefferies, Ltd.

London.—L.C.C.—Main Drainage Committee. Accepted. Electric generating sets, pumping sets, &c., for the precipitation works at the Southern Outfall Works (£10,837)—Crossley Bros., Ltd. The accepted tender was the lowest of nine received, the highest being £13,460.

HACKNEY.—Works Committee. Three batteries for electric vehicles (£386, less £59 for the old batteries).—Chloride Electrical Storage Co., Ltd.
Housing and Town Planning Committee. Recommended.

Electric lighting installation at Lower Clapton Road housing scheme (£1,917).—F. H. Wheeler.

ISLINGTON.—Cleansing Committee. Recommended. Five batteries for electric vehicles.—Britannia Batteries, Ltd.

Moffat.—The Town Council has decided to proceed with the installation of electricity for street lighting, and has agreed to accept the offer of Callender's Cable & Construction Co., Ltd., to carry out the work, and to use the Wardle Engineering Co.'s fittings, the amount of the estimate being £1,021.

Paisley.—Corporation. Accepted. Electric lighting of Newton Street housing scheme.—J. Sweeney.

Sutton Coldfield.—Electricity Committee. Accepted. Transformer kiosk and switchgear, Maney Hill Estate (£355).—General Electric Co., Ltd.

Wrexham.—Rural District Council. Accepted. Installation of electric lighting at thirty-four houses at Berse (£185).—Jones and Williams.

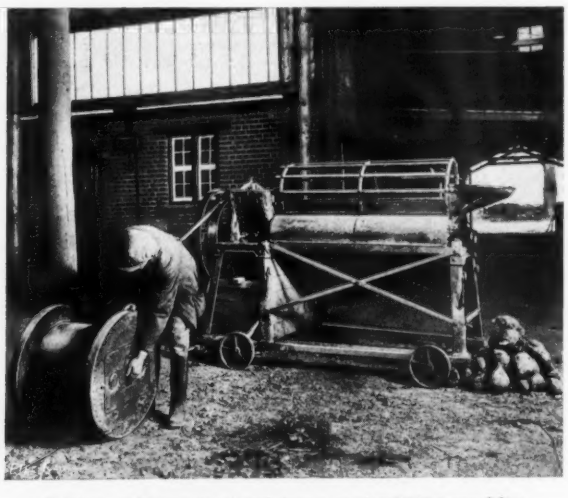
Notes

Rothamsted Experimental Farm

During a visit this week to the Rothamsted Experimental Farm we saw in operation the "Drumotor," which comprises a steel drum on which the trailing cable is wound and in which the driving motor, 5 h.p., 400/440 V, 3 phase, 50 cycles, and control gear is housed. The motor is push-button controlled. Another power unit seen is intended for driving threshing machines, grinding mills, and other equipment about the farm. It consists of a heavy-duty 20-h.p. slip-ring motor, 960 r.p.m., and a rotor and stator starting panel all mounted on a very robust four-wheeled truck. When not in use the "Rhino" tough rubber-sheathed four-core flexible cable is accommodated on a saddle incorporated in the truck.

A sterilising chest for treating dairy utensils was also inspected. This measures inside 2 ft. by 3 ft. by 2 ft., and immersion heaters with a total loading of 4 kW are contained in a water well at the bottom, with suitable communication to the cabinet interior for the steam. The heavy door closes steam-tight by clamp fasteners, and a suitable switch and a pilot lamp complete the equipment.

Other apparatus which we saw about the farm grounds and buildings included a water-pumping installation which has been converted from windmill to electric driving, a "Wallwin" non-chokeable pump directly coupled to a ¾-h.p. repulsion induction motor, all on a common bedplate, and a 10-h.p. frame-cooled slip-ring motor, 575 r.p.m., directly coupled to a grinding and crushing mill. Cattle grooming has been expedited by portable equipment operating on the vacuum cleaner principle, the motor unit and dust bag being strapped to the operator's back. In conjunction with a portable Alfa-Laval milking machine driven by a ¼-h.p. motor a 15-gal. electric storage water heater provides hot water for washing up. A similar water-heating equipment, but of 20-gal. capacity, provides hot water for food mixing in the piggery. The whole



A 5-h.p. "Drumotor" driving a root-pulping machine

of the equipment was supplied by the General Electric Co., Ltd., and the electricity is supplied by the North Metropolitan Electric Power Supply Co., which also carried out all the installation work.

Quarrying Electrically

The relative merits of electricity and oil as motive power formed the subject of a debate at the annual meeting of the South Wales branch of the Institute of Quarrying held in Cardiff this week. Mr. W. A. H. Parker (Gloucester Power Co., Ltd.), who put the case for electricity, argued that electricity had become a necessity because of the ease of transmission. Many firms engaged in oil-engine manufacture published misleading advertisements; he appealed to them to alter their methods and place all the facts before the public. Electricity for a public supply was invariably produced from British coal. As oil-engines used imported fuel, every ton purchased meant the loss of three days' work to a miner, besides affecting our trade balance.

Mr. R. H. Green (Petters, Ltd.) said that the user of electricity did not know what electricity would cost. The price was dependent upon the locality; in one case the purchase of electricity would be economical and in another it would not.

Traffic Beacons

We reproduce herewith an untouched photograph of a new type of traffic beacon which has been designed and patented by members of the City of Salford Police Dept. and manufactured by the Wardle Engineering Co., Ltd. These beacons are installed adjacent to the outlet of the new Manchester to Liverpool road where five roads meet, thus forming a wide junction which hitherto has been dangerous to pedestrians. We are informed that since the installation accidents have been considerably reduced. The beacons are unique in design, and a clear indication in letters 12 in. high is given to approaching traffic by day and by night. They are 6 ft. high and are surmounted by a flashing red signal lamp. The three curved vitreous enamelled plates are each lighted by one 60-W lamp mounted below and behind the corona.

The beacons at a junction of the Manchester-Liverpool road

The R. H. Tree Testimonial Fund

We are pleased to learn from Sir Arthur Preece that the support accorded to this fund by members of the I.E.E. is most gratifying. Up to June 19th no fewer than 314 contributions were received—a striking testimony to the popularity of Mr. Tree. Any members who have overlooked the matter are reminded that it is desired to close the fund next week, and that contributions should be sent to Sir Arthur Preece, the hon. treasurer, c/o I.E.E., Savoy Place, Victoria Embankment, E.C.2.

I.E.E. London Students' Section

A programme of works visits is now under consideration by the committee of the I.E.E. London Students' Section. Owners of works who are willing to provide facilities for such visits assistant secretary for visits, Mr. H. N. Rice, 32, Elsie Road, are invited to communicate as soon as possible with the hon. Dulwich, S.E.22.

Consulting Engineers

At the recent annual general meeting of the Association of Consulting Engineers reference was made by the chairman, Mr. J. S. Alford, to complaints which had been made about whole-time salaried officers undertaking private work. It would be useless, he pointed out, to protest against whole time engineers employed by distributing authorities giving advice to private persons within the authority's area of supply when such advice was directed to the sale of the product to be distributed. If such advice were given to authorities or persons outside the area of supply then the Association could complain.

Appointments Vacant

Deputy electrical engineer for the Stepney Electricity Department.

Shift control engineer for the Charing Cross Electricity Supply Co., Ltd.

(See our classified advertisements.)

Makers' Names Wanted

LIGHTFOOT tubular system of heating.
EXCELSIOR vacuum cleaner.
SERVIS washing machine.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. F. M. Walker, shift charge engineer at the Blackburn Meadows power station of the Sheffield Corporation, has been appointed shift charge engineer at the Neepsend power station, at a salary of £359 per annum.

Mr. A. M. Sillar, M.Inst.C.E., M.I.Mech.E., M.I.E.E., was elected chairman of the Association of Consulting Engineers at the first meeting of the new committee held recently. Mr. Sillar has the distinction of being chairman of the Association for the second time, having held this office in 1922. A full account of his career was published in our issue of December 15th, 1922, from which we have selected the following salient points. Mr. Sillar commenced his engineering career in the works of the Jablochkoff Co., in 1882, and was engaged by that company upon the Thames Embankment lighting, and also in one of London's first electricity supply stations situated in Belvedere Road, Lambeth. He remained with this company and its successors for twelve years, first as assistant and subsequently chief engineer, afterwards entering into partnership with the late Mr. R. F. Venner. In 1896 he commenced practice as consulting engineer with the firm of Messrs. Lacey, Clirehugh and Sillar, and later (in 1913) set up practice on his own account. Mr. Sillar has acted as consulting engineer to numerous electricity supply, tramway, and light railway undertakings in this country, and to many undertakings in the Far East.

[*Elliott & Fry*
Mr. A. M. Sillar

Mr. N. L. Duncan has been appointed by the Swinton and Pendlebury Urban District Council as superintendent of mains and sub-stations, at a salary of £356 per annum.

Mr. N. Applebee.—Considerable discussion took place at a meeting of Ashton-under-Lyne Town Council on June 14th on the recommendation to retire Mr. Neville Applebee, the borough electrical engineer, on July 31st, and appoint him to the position of consulting engineer for a period of three years at a salary of £250 per annum. It was stated in Council that Mr. Applebee was taken ill through overwork, and was therefore entitled to the consideration of the Corporation. The recommendation was confirmed.

Sir Tom Callender was presented with his portrait in oils, by Van Jones, at a luncheon which followed the annual meeting of Callender's Cable & Construction Co., Ltd. Lady

The presentation portrait of Sir Tom Callender

Callender also received a portrait of herself and a dozen silver plates engraved with Sir Tom's crest. The gifts were subscribed for by the directors, staff and workpeople of Callender's to mark the company's jubilee. Sir J. Fortescue Flannery, the chairman of the company, made the presentation, and among those present were Sir Malcolm Fraser, Bt., Mr. Theo. Petersen, Mr. Tom Callender, Mr. P. V. Hunter, Mr. C. Pipkin, Mr. Howard Foulds, Sir Malcolm McIlwraith, Mr. George Barnard, Mr. W. Lang, Mr. F. B. Collard, and Mr. J. F. Watson.

Mr. A. Murray Coombs, M.I.E.E., M.Cons.E., and **Mr. A. F. W. Richards,** M.I.E.E., M.I.Min.E., will dissolve the partnership existing between them for the last fourteen years as from June 30th. Both gentlemen will continue to practise independently as consultants. Mr. Murray Coombs's address for the present will be 2, Henrietta Street, W.C.2 (telephone: Temple Bar 2709), while Mr. Richards will retain the office and clerical staff at Premier House, 150, Southampton Row, W.C.1.

Dr. H. J. van der Bijl, chairman of the Electricity Supply Commission of South Africa, is paying a visit to this country and the Continent. He is representing the Union of South Africa at the International High Tension Conference in Paris, and will attend in a similar capacity the World Power Conference to be held in Stockholm. Dr. van der Bijl is also chairman of the South African Iron and Steel Corporation.

Mr. W. E. Owen has been recommended by the Electricity Committee of Southwark Borough Council for the appointment of installation inspector at a salary of £260, rising to £300.

Mr. P. J. Pybus, C.B.E., M.P., has been elected to the board of Metal Traders, Ltd.

Obituary

Mr. T. W. H. McEwen.—The death is announced from Glasgow of Mr. T. W. H. McEwen, who was the South African manager for British Insulated Cables, Ltd. He was sixty-one years of age, and had represented the company in South Africa for thirty-five years. He had only recently arrived in this country for a holiday. He had been a member of the staff for nearly forty years, and formerly resided at Helsby, where he was chief buyer for the Telegraph Manufacturing Co., which later amalgamated with the Prescot Cable Works to form what is now British Insulated Cables.

Sir Ernest W. Moir, Bt.—The death occurred on June 14th in London, at the age of seventy-one, of Sir Ernest William Moir, Bt., a director of Callender's Cable & Construction Co., Ltd., Callender's Share & Investment Trust, and the Anchor Cable Co., and an advisory director to Messrs. S. Pearson & Son. Sir Ernest was educated at University College School, and at University College, London. He received his engineering training with Messrs. A. Chaplin & Co. and R. Napier & Sons. Later he joined the staff of Messrs. Tancred, Arrol & Co., with whom he was employed on the construction of the Forth Bridge. He went to America as resident engineer of the Hudson River Tunnel Works, linking New York to the mainland. On returning to England he joined the staff of Messrs. S. Pearson & Son, Ltd., and became a director in 1900. He was responsible for many important engineering works. In 1919 he was appointed an officer of the Legion of Honour, and was created a baronet in 1916. To Lady Moir, who is the president of the Electrical Association for Women, we tender our sympathy in her bereavement.

[*Elliott & Fry*
The late Sir Ernest Moir

A memorial service was held at St. Margaret's, Westminster, on June 19th, and among those present were: Sir Richard Redmayne, Sir Malcolm and Lady Fraser, Sir Alexander Gibb, Sir Harley Dalrymple-Hay, Mr. H. T. Tizard (rector of the Imperial College of Science and Technology), Mrs. Swire (representing the Electrical Association for Women), Miss C. Haslett (hon. secretary of the Women's Engineering Society), Mr. T. O. Callender (representing Sir Tom Callender), Mr. T. Petersen (assistant managing director of Callender's Cable & Construction Co., Ltd.), Mr. H. Foulds (secretary of Callender's), and Mr. Frank Broadbent (British Electrical and Allied Manufacturers' Association).

Mr. G. L. Just.—Mr. G. L. Just, manager of Australian General Electric Supplies Co., Ltd., Melbourne, has died at the age of forty-eight. He was formerly general manager in Australia for the Edison Swan Electric Co., Ltd. Mr. Just had several times been president of the Electrical Federation of Victoria.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Telegraph Condenser Co., Ltd.—Registered as a public company June 15th. Capital: £280,000 in 130,000 6 per cent. cumulative preference shares of £1 and 300,000 ordinary shares of 10s. each. Objects: To acquire the business now carried on by the Telegraph Condenser Co., Ltd., to adopt an agreement with the said company and its liquidator, and to carry on the business of manufacturers of and dealers in all apparatus for use in connection with the generation, distribution, supply, accumulation or employment of electricity, electricians and mechanical engineers, &c. The directors are: Lord Ebbisham, Fairmile Hatch, Cobham; E. H. F. Reeves, Everden, Lucerne Road, Orpington, Kent; S. G. Brown and Mrs. Alice S. G. Brown, "Brownlands," Shepperton, Middlesex; and Wm. J. Cole, "Fieldhead," Corkran Road, Surbiton, Surrey. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.

Alexander Black, Ltd.—Private company. Registered June 12th. Capital, £3,000 in 1,200 5 per cent. first cumulative preference shares of £1, 1,300 5 per cent. second cumulative preference shares of £1 and 1,000 ordinary shares of 10s. each. Objects: To acquire the business of a wireless consultant and designer, manufacturer, seller, repairer and hirer of electrical apparatus and sound amplifiers now carried on by K. A. B. Gilfillan at 55, Ebury Street, S.W., as "Alexander Black." The directors are: K. A. B. Gilfillan and Mrs. A. M. Gilfillan, 55, Ebury Street, S.W.1. Registered office: 55, Ebury Street.

North London Electrical Supplies, Ltd.—Private company. Registered June 14th. Capital, £2,500 in £1 shares. Objects: To acquire the business of electrical speciality suppliers now carried on by Henry R. Prickett and Geo. Booth as "The North London Electrical Supplies," at 4, High Street, Camden Town, and elsewhere. The directors are: H. R. Prickett, 4, High Street, Camden Town, N.W.1, and H. H. Crockford, Dunalaister, Staines Road, Sunbury-on-Thames. Secretary: H. H. Crockford. Registered office: 4, High Street, Camden Town.

Hawley Products, Ltd.—Private company. Registered June 12th. Capital, £10,000 in £1 shares (4,080 "A," 3,920 "B" and 2,000 unclassified). Objects: To carry on the business of manufacturers of and dealers in materials, apparatus and appliances for use in connection with the transmission or reproduction of sounds, signals, &c. The subscribers are: J. F. Warre-Rathstone, 53, Romney Street, Westminster, S.W.1; and S. F. A. Clarke, 37, Midholm, N.W.11. The first directors are: A. H. J. Bull, H. J. Madge and G. J. Corrigan. Registered office: 85, Gracechurch Street, E.C.3.

Notts & Derby Radio Relays, Ltd.—Private company. Registered June 15. Capital, £5,000 in £1 shares. Objects: To construct and maintain wireless signal and receiving stations; to receive and relay signals, broadcast programmes, &c. The directors are: Frank Moss, "Sandridge," Nottingham Road, Mansfield, Notts; Leonard R. Moss, 6, King Edward Avenue, Mansfield. Registered office: Halford Chambers, Market Place, Mansfield.

Invicta Radio, Ltd.—Private company. Registered June 15. Capital, £1,000 in £1 shares. Objects: To carry on business as radio distributors and engineers, &c. The directors are: Harold Mansell (permanent director and chairman), and Rosalind C. Mansell, both of 30, Leinster Terrace, W.2. Registered office: 114, Southampton Row, W.C.1.

Falcon Batteries, Ltd.—Private company. Registered June 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in accumulators, &c. The subscribers are: Eileen M. Evans, 3, Burman Street, Swansea; and Nancy L. Sheppard, 23, Clarence Embankment, Cardiff. Secretary: Eileen M. Evans. Registered office: 31, Oxford Street, Swansea.

J. Burney, Ltd.—Private company. Registered June 17th. Capital, £1,000 in £1 shares (500 6 per cent. cumulative preference and 500 ordinary). Objects: To acquire the undertaking and all or any of the assets and liabilities of J. Burney, trading at 126, Evington Road, Leicester, wireless set dealer and electrical engineer. The life directors are: J. Burney and Mrs. Elizabeth Burney, both of 126, Evington Road, Leicester.

Returns of Electrical Companies

Viking Sales, Ltd.—Particulars filed of debentures to secure not more than £10,000 authorised June 1st, 1933, charged on the company's undertaking and property, including uncalled capital (subject to charges created on hire purchase agreements by three agreements dated November 13th, 1929, May 11th, 1931, April 27th, 1932), the amount of the present issue being £2,000. (The above debentures rank in priority to £7,000 debentures, created May 9th, 1932, and £10,000 second debentures created December 22nd, 1932.)

Electro-Mechanical Brake Co., Ltd.—Capital, £30,000 in 2,500 preference and 27,500 ordinary shares of £1 each. Return dated September 26th, 1932 (filed March 24th, 1933). 1,500 preference and 26,500 ordinary shares taken up. £21,965 paid on 1,500 preference and 20,465 ordinary shares. £6,035 considered as paid on the remainder. Mortgages and charges, £41,312.

Bray, Markham & Reiss, Ltd.—Capital, £20,000 in 10,000 6 per cent. preference and 10,000 ordinary shares of £1. Return dated January 12th, 1933. 10,000 preference and 7,080 ordinary shares taken up. £16,080 paid on 10,000 preference and 6,080 ordinary shares. £1,000 considered as paid on 1,000 ordinary shares. Mortgages and charges, nil.

Reliaphone Mfg. Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1932 (filed March 29th, 1933). Two shares taken up. £2 paid. Mortgages and charges, nil.

North London Valve & B.U.R.T.S., Ltd.—Capital, £2,000 in 7,600 preference shares of 5s. and 2,000 ordinary shares of 1s. each. Return dated October 10th, 1932 (filed March 14th, 1933). 3,000 preference and 1,802 ordinary shares taken up. £750 paid on 3,000 preference shares. £90 2s. considered as paid on 1,802 ordinary shares. Mortgages and charges, £8,500.

Dennison Kett & Co., Ltd.—Land Registration Charge on land in Farmer's Road, Camberwell, S.E., dated May 23rd, 1933, to secure all moneys due or to become due from the company to Barclays Bank Ltd.

F. R. Horwood & Co., Ltd.—Particulars filed of debentures to secure £500 and bonus of 5 per cent. authorised by resolutions of May 25th and June 1st, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

Gothic Electrical Supplies, Ltd.—Capital, £6,000 in £1 shares. Return dated January 14th, 1933. All shares taken up. £5,400 paid, £600 considered as paid. Mortgages and charges, nil.

Imeson & Finch, Ltd.—Capital, £2,500 in £1 shares. Return dated December 31st, 1932 (filed February 8th, 1933). 1,400 shares taken up. £1,400 paid. Mortgages and charges, nil.

"Ros-Rol" Products Co., Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £1,000. The additional capital is divided into 2,000 6 per cent. cumulative preference shares of £1 each.

Llanselin Electricity Co., Ltd.—Capital, £1,500 in £1 shares. Return dated December 31st, 1932. 1,260 shares taken up. £1,260 paid. Mortgages and charges, nil.

City Notes

Callender's Cable & Construction Co., Ltd., held its annual meeting on June 15th, Sir J. Fortescue Flannery (chairman) presiding. In presenting the report and accounts (ELEC. REV., June 9th, page 832), the chairman said they were meeting at a time of unprecedented uncertainty and confusion in the trade and finance of the whole world. The scarcity at the end of the war of ordinary commodities produced a state of great activity and prosperity, and those manufacturers and traders who during the busy years laid by something for a rainy day had reason to be thankful now that the inevitable reaction had overtaken the trade of the world. Amongst these manufacturers were Callender's, who held a definite place as the makers of prudent reserves and as makers of a commodity so new to the world that it was not excessive in supply. It was no exaggeration to say that the application of electricity to the service of mankind was in its infancy, and they might be expected to take their full share in all future developments. Orders received during the year had been in the nature of "bread and butter" business. Few large contracts had been secured, although they received a short time ago an important order for distributor cables for London, and a considerable amount of other work continued to come in. In their Overhead Department they had been exceptionally busy, and perhaps the most spectacular of their work was carrying the 132,000-V line across the River Thames at Dagenham. In the South-West of England they had been completing a contract for the Central Electricity Board for extending the grid, and they had carried through an accelerated programme to execute the various contracts speedily; this work was now nearly completed. A fresh department had been built at their Erith works in order that they might be in a position to meet the present demand, and what they believed would be an increasing demand, for high voltage cables, and there had been an increase in orders from various supply authorities in consequence. They had also further equipped their Research Department at Wood Lane, which they hoped would be completed very shortly; in this they would possess one of the best research laboratories in the world devoted exclusively to cable manufacture.

The chairman then referred to the appointment of Messrs. P. V. Hunter and C. Pipkin as advisory directors, and congratulated Mr. Hunter on his nomination as president of the Institution of Electrical Engineers. In reviewing the accounts he pointed out that this was the fourteenth year in succession that the company had paid a dividend of 15 per cent. Regarding the future, on the whole he was optimistic; since the beginning of the year the order-sheet had improved, although prices, owing to severe competition, were suffering. Nevertheless, the outlook was brighter. The international situation might become better, and as their business extended to almost every corner of the civilised globe any improvement in trade ought to be reflected in an improvement in their business.

Sir Tom Callender, in seconding the resolution, said he joined with the chairman in his expression of optimism. He believed that the general outlook was distinctly better in nearly all respects at the present moment than it was last year. In the early part of the year there was a considerable reduction in the volume of their business, which was gradually but surely passing to the other side of the account; his last report showed that they had actually exceeded all records for the year, more orders were being placed than a year ago, and they were orders for cables which tended to bring in other orders in the future. On the other hand, the price of materials of every kind had fallen since they last met, and at the moment there seemed little chance of a permanent and stabilised revival in copper, lead, and the other materials which they employed so largely, and he was sure that no permanent prosperity could exist until raw materials became saleable at a fair price. They had lately renewed many of the contracts which they had held with municipalities throughout the country for many years past, and in particular they had renewed one with the City of Bir-

mingham, which had lately enlarged its borders so as to be in extent the greatest municipal undertaking in this country, and in every one of the former separate areas which were now under the ægis of Birmingham they were getting work. Greater Birmingham was probably the area at the present moment in which more electrical activity prevailed than any other part of the country. Referring to their overseas business, Sir Tom said the difficulties in every part of the world had dogged their footsteps abroad. In South America, owing to financial and other conditions, business had practically ceased, while in China insurrection and war had materially hindered electrical enterprise. They had come to the conclusion that China had so many vast possibilities that they had to bear a present loss, believing that it would be well repaid in the near future. In Australia development in cable work had almost ceased, but they had recently received some excellent orders for a class of insulated wire and cable which they had specially developed for tropical use. A considerable amount of their underground materials were being used in Mosul; similar extensions were taking place in Basra, while they had broken new ground in Siam. In many parts of the East and the Near East there was a quiet but steady improvement in trade during the last few months.

Sir Malcolm Fraser, who recently visited India for the opening of the Uhl River undertaking, outlined the many activities of the company in India, and stated that the company's cables were in continuous demand by over twenty-five native States and other important power producers in India itself. He referred to the Uhl River undertaking, for which Callender's had completed the whole of the transmission lines, forming one of the great systems which would be extended later on to build up still larger networks.

Whitehall Electric Investments, Ltd., held its annual meeting on June 15th, the Hon. Clive Pearson (chairman), presiding. In presenting the report and accounts (ELEC. REV., June 9th, page 833), the chairman said that the Athens Electricity Co. had been engaged for the past three years on a comprehensive programme of development and reconstruction. Works which had been carried out included the remodelling and extension of the distribution system, the change-over of consumers to a.c., and the reconditioning of consumers' private wiring systems. The number of consumers had increased during the past two years from 25,000 to 85,000. The sales for domestic purposes showed an increase of 38 per cent., over the preceding year, but there had been a falling-off in the sales to industrial and commercial consumers. The results had been affected since April, 1932, by the depreciation in the value of the drachma, and an increase in electricity tariffs had been made in partial compensation for the fall in the sterling value of the earnings. A further increase in tariffs was under consideration. The Lecrin company in the south of Spain had made progress with its programme of improving and extending the transmission system and in equipping and building sub-stations; further, the change-over of the system of supply in Almeria was practically completed. The new 10,000-kW hydro-electric plant at Izbor would be ready for operation in two or three months and a vigorous campaign was being conducted to build up new business. In the West of England the programme of co-ordinating the various undertakings and modernising and expanding the distribution systems was completed last summer. These operating companies now held supply powers over a compact area in Devon and Somerset, 1,250 sq. miles in extent, and a supply was now available in eighty-seven towns and villages, in forty-one of which street lighting was being supplied under contract. A uniform two-part tariff had been introduced over the whole area, showrooms had been opened, and arrangements for the hire and hire-purchase of apparatus and wiring had been introduced. Sales of energy during 1932 amounted to 8,000,000 kWh, an increase of 38 per cent. over the figure for the previous year. Their investment in the West of England was now close upon £1,000,000.

Broadcast Relay Service, Ltd., has published a prospectus of an issue opened on Wednesday last of £125,000 of 7 per cent. redeemable debentures at par and 125,000 1s. ordinary shares at par, the latter being available only to applicants for debentures, at the rate of 100 shares for £100 debentures. The holders of the existing debentures for £25,000 have agreed to exchange for debentures of this issue at the rate of £100 of the new debentures for £100 of debentures held, and have been given the right to subscribe for 140 ordinary shares of 1s. each at par for every £100 of debentures exchanged. The company operates a relay system in Hull and Ramsgate and the proceeds of the new issue are required for extending the business to other industrial towns. Negotiations have been initiated for the extension of the business to three important towns in which the major portion of the development work has already been done.

The General Electric Co., Ltd., reports a profit for the year ended March 31st last of £1,012,739, as compared with £1,057,657 in the preceding year. To this is added £420,136 brought in, making £1,432,875, from which the following charges have to be met: Debenture interest, £171,927; depreciation, £233,291; directors' remuneration, £4,355; contribution to pension fund, £32,014. After providing for preference dividends and placing £137,750 to reserve (raising this to £1,500,000) it is proposed to pay a dividend of 8 per cent. on the ordinary shares for the year (same) and to carry forward £421,245. The report states that in overseas markets lack of purchasing power, coupled with restrictions upon exchange and imports, has continued to hinder export business. The trading of the company's overseas branches has been affected by these conditions, though a slight improvement is visible in Australia. The company's works, on the whole, were fully employed during the period, and the output generally continued at a satisfactory level. In the heavy engineering departments, however, the volume of incoming orders still tends to diminish, owing mainly to the lack of demand on the industrial side. At March 31st the company's liquid resources amounted to £2,020,000, an increase of £462,000 over the previous year. During March an issue of £3,500,000 4½ per cent. debenture stock, mainly to provide funds for the redemption of the 5 per cent. debenture stock, met with marked success. Of the 5 per cent. stock only £973,440 remains unconverted, and this will be redeemed on September 30th next. The benefits of this conversion will accrue in subsequent years. The number of employés at March 31st was 22,703, a decrease of 1,482 as compared with the preceding year. The report records the death of Mr. H. Wynne Roberts, a director. Meeting: June 28th.

As in previous years with the report the company has issued an illustrated brochure recording the progress made during the year.

Ward & Goldstone, Ltd., held their annual meeting on June 21st. Mr. M. H. Goldstone (chairman), who presided, said the results of the past year's activities represented a substantial advance. Friendly criticism had been received on account of the declaration of only 7 per cent. on the ordinary shares, as it had been pointed out that their profits would justify a more generous distribution. The policy of the directors had always been to increase the company's reserves and allow liberally for depreciation, and as a result they had been able until now to weather the stormy industrial conditions of the past few years. When the industrial barometer pointed to set fair, they hoped to declare dividends more in keeping with their profits. During the past year, in spite of fierce competition and falling prices, their output and turnover had increased. Regarding the future, there had been a marked advance in the raw materials of their industry, and by reasons of its modern plant, equipment, and ample resources, the company was capable of meeting all fair home and foreign competition and of increasing output to provide the demands a trade revival might create.

The British Electric Traction Co., Ltd., held its annual meeting on June 20th, when Mr. J. S. Austen (chairman), who presided, in the course of his speech, said that all through the year they had had a large sum of money unemployed; at the end of the year they had nearly £240,000, beside the money invested in Government securities. They had not invested that money as they thought that by waiting they could do better. Those companies with whose management they were actively concerned had done quite well during the past year. As to the current year, their decreases were at an end, and once more they were on the upward grade. They were reverting to their original custom of paying this year a 10 per cent. stock bonus. An original holder of £100 of that stock who had kept it now held £321.

The Brazilian Traction, Light & Power Co. reports a net revenue for 1932 of $5,239,468, as compared with $9,389,104 in 1931; this revenue, less preference dividends, is equivalent to 76 cents per share on the ordinary shares. Ordinary shareholders received during the year one quarterly cash dividend of 25 cents per share and two quarterly stock dividends, each on the basis of one share for each 50 ordinary shares. In view of continuing exchange and remittance difficulties, no dividend was declared for the final quarter. The amount brought in is $15,759,744, which with the net balance for 1932 of $1,622,098, making $17,381,842, is carried forward.

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., has announced that a scheme for the reconstruction of the company is in preparation, including the reorganisation and reduction of the share capital and the provision of further working capital. The directors advise the shareholders to await the publication of details of the scheme, which will be issued as soon as it has been drafted by the company's legal advisers.

Ransomes, Sims & Jefferies, Ltd., report a loss for the year ended March 31st last of £15,726, plus debenture interest, &c., of £11,356, making £27,083, as against a loss of £18,042 in 1931. The balance brought in is £7,686, and £35,000 is transferred from reserve, making £42,686. After deducting the year's loss, a credit balance of £15,603 is carried forward. Meeting: June 28th.

James Keith & Blackman Co., Ltd., report a net profit for the year ended March 31st last of £13,349, as compared with £3,056 in the preceding year, and an available balance, after paying the preference dividend, of £23,256 (£19,519). It is proposed to pay an ordinary dividend of 8 per cent., against 5 per cent., and to carry forward £11,256.

W. T. Henley's Telegraph Works Co., Ltd., proposes to pay a final ordinary dividend of 2s. 6d. per share, less tax, making 4s. per share for the year. It is also proposed to pay a cash bonus of 2s. per share, less tax. The total distribution for the year is thus maintained at 30 per cent.

The Hendon Electric Supply Co. is to give notice in July of repayment at par of the £250,000 outstanding five per cent. debenture stock. Holders will be given the opportunity of converting their holding into a four per cent. stock.

Stocks and Shares

TUESDAY EVENING.

FINANCIAL forces throughout the world are in a state of confusion sufficiently marked to explain the erratic tendencies shown by a good many of the markets in the Stock Exchange. Some of the City authorities whom one has been accustomed to regard for years past as experts, now acknowledge, candidly enough, that they are baffled in the attempt to look ahead, with any degree of certainty, even for the next few years.

All things considered, Stock Exchange markets contrive to maintain a tolerably even keel amidst cross-currents that lead to caution being deemed the best pilot for such uncertain tides as those now current.

Home Electricity Supply

Prices in the home electricity supply group show a disposition to droop. Every now and then a few shares come in, and, instead of being gladly absorbed, as would have happened a month ago, they may take a little time in which to find a home. Charing Cross Electric ordinary and St. James' ordinary are each 6d. lower at 33s. and 32s. respectively. In the provincial list, Bournemouth & Poole have eased off to 3⅞, Electrical Distribution of Yorkshire to 44s. 6d. West

Gloucestershire ordinary eased off, from 66, to 65½. Electric Supply Corporation shares failed to recover from their last week's reaction to 64s. 6d. In the new shares, Llanelly are a little better at 4½d. premium. North Metropolitan Electric new shares remain at 18s. 6d. There is a quiet demand for most of the best-class securities in this market, although, as already mentioned, when stock comes in there may not always be a ready-made buyer to take what is offered.

Whitehall Electric 7½ per cent. preference at 20s. 9d. show a gain of 2s., inquiry having been stimulated by the speech of the chairman at last week's meeting. The Hon. Clive Pearson mentioned how difficult it is for anyone to be optimistic as to the position and prospects of any particular properties without some assurance in regard to the recovery of world economy as a whole—remarks which may be well applied to many other companies and branches of industry outside those of Whitehall Electric Investments.

The new issue of 3½ per cent. stock made by the Central Electricity Board at 93½, and left to the extent of 58 per cent. with the underwriters, rallied at one time during the past few days to ¾ discount, from which, however, it fell away to 1 discount. The recovery in the price attracted sales, and, upon the War Loan easing off in consequence of the disappointment felt with President Roosevelt's attitude, the price went back in sympathy with other gilt-edged stocks.

Manufacturing and Equipment

The announcement by Henley's of a final dividend for the year, making 30 per cent. on the ordinary, is regarded as very satisfactory, and as justifying the rise, which took place previously, to 6¼. After the dividend announcements by Callender's, British Insulated and Enfield, the maintenance of the 30 per cent. dividend on Henley's was generally anticipated, although the rate is, in itself, so generous as to excuse a little doubt being felt as to its retention during days of depressed trade, and of curtailed expenditure upon the manufactures for which the company is famous.

At the present price, the yield on the money comes to 4¾ per cent., or, allowing for the accrued dividend, a little more, comparing with 5 per cent. that Callender's pay at £3, 4½ per cent. afforded by British Insulated, and 5½ per cent. by Enfield Cable shares. The General Electric Company's dividend of 8 per cent. is the same as that of a year ago. Profits show a decline, but the result for the year is decidedly favourable in view of the difficulties encountered by industry during the period for which the dividend is declared. The price of the shares is 6d. harder at 43s. 9d., at which the return on the money is about 3½ per cent. The 6½ per cent. preference at 29s. yield 4½ per cent. Siemens ordinary have been weak, falling to 22s. 6d. before the price recovered to 23s. 9d., the latter showing a trifling decline. Crompton Parkinson 8 per cent. preference are ½ down at 28s. 9d., a reflection of the recent dividend announcement.

India Rubber shares are better at 3s. 3d., and the preference show improvement at 6s. 3d. A scheme is under consideration for putting the company's finances upon a better footing.

Home Railway Stocks

In the Home Railway market, the Underground stocks keep very steady. Central London assented ordinary at 90 shows a gain of 2½ points. Underground Electric Railway ordinary shares at 22s. are 6d. up. The prior-charge stocks are inclined to be a little lower in correspondence with gilt-edged securities as a whole. Of the transport securities, British Electric Traction deferred ordinary at 375 has parted from 50 points of the 110 which it gained last week. London & Suburban Traction preference shares retained their rise at 19s. Tilling & British Automobile Tractions rose nearly 5s. to 48s. 6d., upon the proposal to distribute a bonus. In the foreign list, Anglo-Argentine Tramways first preference continue their advance, showing a small gain at 7s. 6d., and Brazilian Tractions reacted, after the substantial recovery which occurred a week ago, falling ¾ to 18¼.

Cables and Wireless

A certain amount of demand for cables and wireless stocks was attributed to speculative buying on the part of those who look for the combine to derive a good deal of benefit from the Economic Conference. The price of the preference, at 76½, shows a gain of 2, and the "A" ordinary at 26½ is the fraction to the good. Globe Telegraph preference are better at 11¾. The ordinary shares strengthened to 11. American Telephone and Telegraph shares at 160½ are 3 points up, and International Telephone & Telegraph, after being down to 20½, recovered to 22½. Western Union Telegraph common stock at 70 is 5 points higher

Miscellaneous Matters

The price of raw rubber, after a fall to a shade under 3d. per lb., upon a spasm of weakness in Mincing Lane, promptly recovered nearly ¼d. per lb. on the Roosevelt announcement, which suggested, of course, inflation of prices. The shares have followed the vagaries of the produce, and the fluctuations attracted rather more attention than the market receives as a rule. The iron and steel group is quiet, without any special feature. Tokyo Electric sixes gave way to 74½, but rallied to 76½. Calcutta Electrics, on renewed uneasiness respecting Indian affairs, lost a few pence, at 47s. 9d. Electric Finance and Securities at 61s. and Atlas ordinary at 8s. 6d. have gone back to a slight extent.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, June 20.	Rise or Fall.	Yield. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	72/6	—½	4 2 4
Brompton Ordinary	1	8½	7	32/6	—	4 6 2
Central Electricity 4½% Deb.	Stock	4½	4½	105	—	4 5 9
Charing Cross Ordinary	1	8d	7	33/0	—6d.	4 4 10
Chelsea	1	8½	7	32/6	—	4 6 2
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	35/–	—	4 0 0
County of London	1	10½	10½	53/3	—	3 19 2
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	44/6	–6d.	4 1 0
Elec. Supply Corporation	1	11	11	64/6	—	3 8 4
Kensington Ordinary	1	8	7	33/–	—	4 4 10
Lancs Light and Power	1	7	7	31/3	—	4 9 7
London & Home Counties 4½%Deb.	Stock	4½	4½	109	—	4 3 4
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	49/6	–6d.	4 1 0
Midland Counties	1	7	7	35/–	—	4 0 0
Mid. Elec. Power	1	8	8	37/6	—	4 5 4
North Eastern Electric Ordinary	1	6	6	30/–	—	4 0 0
Do. 7% Pref.	1	7	7	32/–	—	4 7 6
Northampton	1	10	10	50/–	—	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	28/6	–6d.	4 4 3
St. James' and Pall Mall	1	8	7	32/–	—6d.	4 7 6
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/–	—	4 4 10
Urban Ordinary	1	7	7	37/6	—	3 14 8
Westminster Ordinary	1	8½	7	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	+2/–	7 4 7
Yorkshire Elec.	1	8	8	43/3	—	3 14 3
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	90	+2½	4 9 0
Metropolitan	"	2½	1⅛	72	—	2 5 2
Do. District	"	4½	3	69½	—	4 6 4
Underground Electric	1	7	4½	22/–	+6d.	4 1 9
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	160½	+3	5 12 3
Anglo-Am. Tel. Pref.	Stock	6	6	106	+½	5 13 2
Do. Def.	"	1½	1½	23½	—	6 7 8
Cables & Wireless 5½% Pref.	"	2¾	2¾	76½	+2	3 12 0
Do. A 7½% Ord.	"	Nil	Nil	26½	+½	—
Do. B Ord.	"	Nil	Nil	12½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	11	+¾	2 5 5
Do. do. Pref.	10	6	6	11¾	+⅛	5 2 2
Great Northern Tel.	10	20	20	29	+1	6 18 0
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	2⅜	—	*4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/6	+6d.	—
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	14½	—	—
British Electric Traction Def. Ord.	"	5	5	375	—50	—
Do. do. Pref. Ord.	"	8	8	135	+1	5 18 5
Brazil Traction	100	—	—	18½	–¾	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/–	—	—
London United Tram Deb.	Stock	4	4	75½	—	5 6 0
Mexico Trams, 5% Bonds	—	5	5	36½	—	13 14 0
Mexican Light Common	100	Nil	Nil	14½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	65½	+1	7 13 10
Victoria Falls Ord.	1	15	15	84/6	+9d.	3 11 1
Yorkshire (West Riding)	1	Nil	Nil	9/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	17/6	—	4 11 5
Do. Pref.	1	8	8	28/3	—	5 13 3
Babcock & Wilcox	1	14	9	34/6	—	5 4 4
British Aluminium Ord.	1	5	5	28/3	—	3 10 10
British Insulated Ord.	1	15	15	67/6	—	4 9 3
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	3	—	5 0 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/–	22½	—	17/6	—	6 8 7
Do. 8% Pref.	1	8	8	28/9	—½	5 11 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	12/6	—	—
Enfield Cable Ord.	1	25	25	4½	—	5 11 1
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	12/6	—	—
Ever Ready	5/–	35	35	26/9xd.	—	6 10 10
Ferranti Pref.	1	7	7	24/3	—	5 15 9
G.E.C. Pref.	1	6½	6½	29/0xd.	—	4 9 8
Do. Ord.	1	8	8	43/9	+6d.	3 13 9
Henley's	1	30	30	6¼	+¼	4 15 10
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/3	+9d.	—
Johnson & Phillips	1	5	5	18/3	—	5 9 7
Siemens Ord.	1	7½	6½	23/9	—9d.	5 9 5
Telegraph Construction	£1	Nil	Nil	18/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1931

23505. "Convertor systems employing metal-vapour valves." Akt. Ges. Brown, Boveri et Cie. September 10th, 1930. (392944.)

31447. "Electric lighting equipment." A. Reyrolle & Co., Ltd., and R. M. Russell. November 13th, 1931. (Cognate application 35131/32.) (392925.)

31978. "Direct-current commutator-electric machines." B. C. Von Platen. November 19th, 1930. (Addition to 388061.) (392950.)

32025. "Electrical switches or circuit breakers." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. November 18th, 1931. (Cognate application 17535/32.) (392926.)

32249. "Means for eliminating undesirable harmonics in electric circuits." British Thomson-Houston Co., Ltd., and R. T. Coe. November 20th, 1931. (392953.)

32273. "Device for the pupinisation of telephone cable circuits." Staat Der Nederlanden. October 6th, 1931. (392955.)

32587. "Electrical signalling systems." Automatic Electric Co., Ltd. December 13th, 1930. (392919.)

32593. "Recording telegraph systems." Marconi's Wireless Telegraph Co., Ltd., and T. D. Parkin. November 24th, 1931. (392920.)

32835. "Methods of synchronising the sectional drives of multi-electric motor driven machines." International General Electric Co., Inc. November 26th, 1930. (392941.)

32848. "Earthing reactances." J. B. Hansell and Associated Electrical Industries, Ltd. November 26th, 1931. (392942.)

32853. "Electric secondary cells or batteries." E. Almeida and Sir A. P. du Cros. November 26th, 1931. (392943.)

32919. "High-frequency signalling systems." Standard Telephones & Cables, Ltd. January 21st, 1931. (392962.)

32920. "Electric discharge devices." Standard Telephones & Cables, Ltd. February 11th, 1931. (392963.)

32921. "Switches such as are used in automatic telephone systems." Standard Telephones & Cables, Ltd., C. P. Smith and G. Newton. November 27th, 1931. (392964.)

33426. "Electric motor controllers." R. M. L. Evans and Associated Electrical Industries, Ltd. December 2nd, 1931. (392981.)

33914. "Electric drives for rotary machines." International General Electric Co., Inc. December 6th, 1930. (Addition to 31890/31.) (392983.)

34052. "Two-rate electricity meters." E. Whitby, I. A. D. Pedler, E. J. Selston, L. R. Lester and A. J. Newman. December 8th, 1931. (392986.)

34646. "Systems of electric motor control." International General Electric Co., Inc. December 13th, 1930. (392991.)

35377. "Boxes for linking-up electrical mains or cables." Metropolitan Electric Supply Co., Ltd., and H. Richardson. December 22nd, 1931. (392997.)

35750. "Electric totalisators." H. D. Black and A. A. C. Degen. December 24th, 1931. (393000.)

1932

207. "Electrical chokes." G. V. Dowding. January 4th, 1932. (393003.)

1969. "Electric contact devices." Siemens Bros. & Co., Ltd., and H. E. Humphries. January 22nd, 1932. (393015.)

2378. "Protection of electrical apparatus." General Electric Co., Ltd., and W. Wilson. January 26th, 1932. (393019.)

5435. "Jewel bearings for the rotary elements of electric meters." G. A. Cheetham and Associated Electrical Industries, Ltd. February 23rd, 1932. (393033.)

9298. "Process for the manufacture of an insulating substance for electro-technical purposes." Siemens Schuckertwerke Akt.-Ges. March 31st, 1931. (393048.)

9393. "Electric contacts for variable resistances and the like." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. December 23rd, 1931. (393049.)

11566. "Mounting of heating elements in electric cookers and the like." J. Jardine and British National Electrics, Ltd. April 22nd, 1932. (393060.)

11844. "Liquid-break electric switches." International General Electric Co., Inc. April 25th, 1931. (393062.)

12493. "Electrical controllers." R. Amberton and Electrical Apparatus Co., Ltd. April 30th, 1932. (393067.)

12508. "Separators for use in electric accumulators." Chloride Electrical Storage Co., Ltd., and B. Heap. April 30th, 1932. (393068.)

13008. "Electrically insulated copper conductors." International General Electric Co., Inc. May 5th, 1931. (393070.)

16403. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. June 10th, 1932. (393089.)

20519. "Means for controlling time mechanisms in accordance with the frequency of an a.c. supply." Siemens Schuckertwerke Akt.-Ges. July 20th, 1931. (393109.)

20555. "Fixing-blocks for electric switches, lamp connections, and like fittings." A. N. Eyre. July 21st, 1932. (Cognate application 26906/32.) (393110.)

20998. "Circuit arrangement for telegraph exchange systems with relay repeating circuits." Siemens & Halske Akt.-Ges. July 25th, 1931. (393111.)

21459. "Electric automatic circuit breakers." Nalder Bros. and Thompson, Ltd., and A. B. Gibbons. July 29th, 1932. (393116.)

21687. "Picture analysing and synthesising devices, more particularly for television purposes." Fernseh Akt.-Ges. August 6th, 1931. (393119.)

24317. "Devices for the production and reception of ultra-short waves." Dr. K. Kohl and Suddeutsche Telefon-Apparate-Kabel und Drahtwerke Akt.-Ges. Tekade. August 31st, 1931. (393136.)

24372. "Pressure-operated movable contactors, for use with automatic traffic-control systems involving electrical circuits." S. T. Quilliam. September 1st, 1932. (393140.)

35207. "Short-wave modulated radio and other carrier wave transmitters." Telefunken Ges. für Drahtlose Telegraphie. December 12th, 1931. (393206.)

35731. "Alternating-current motors." Barber-Colman Co. December 21st, 1931. (393211.)

1933

2276. "Electrical plug-and-socket connectors." A. P. Lundberg & Sons, Ltd., and G. Pegg. January 24th, 1933. (393225.)

2449. "Electric circuit breakers with arc-extinguishing arrangements." W. W. Triggs (Felten & Guilleaume Carlswerke Akt.-Ges.). January 25th, 1933. (393226.)

4859. "Electrical switches or circuit breakers." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. November 18th, 1931. (Cognate application 4860/33.) (Divided application on 32025/31.) (392930.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 14th :—

Earl. No. 540856. Class 8. Instruments and apparatus and parts thereof for use in radio-telegraphy and telephony.—Electri-clocks & Radio, Ltd., Avenue Works, Hanover Park, Peckham, S.E.15.

Luxstand (lettering and design). No. 538664. Class 8. Advertising devices consisting of a stand internally provided with an electric or other lamp.—Armando Cigarini, 34, Harrington Road, South Kensington, S.W.7.

Turbonit, also Thermica and Turbomic. Nos. 540094, 540095, and 540096. Class 50. An insulating material for electrical purposes composed of mica.—Jaroslaw's Erste Glimmerwarenfabrik. Gesellschaft, Berlin. (British representatives: Soloman, Staddon & Barnes, 58, Finsbury Pavement, E.C.2.)

British Overseas Electrical Trade in May

	Exports.			Imports.			Re-Exports.		
	Electrical exports for May, 1933.	Inc. or dec. as compared with April, 1933.	Inc. or dec. as compared with May, 1932.	Electrical imports for May, 1933.	Inc. or dec. as compared with April, 1933.	Inc. or dec. as compared with May, 1932.	Electrical re-exports for May, 1933.	Inc. or dec. as compared with April, 1933.	Inc. or dec. as compared with May, 1932.
Insulated wires and cables ...	£96,227	+ £1,587	− £4,277	£17,310	+ £4,195	+ £3,800	£119	+ £92	+ £106
Electric carbons	3,505	+ 2,121	+ 2,293	10,907	− 2,310	+ 7,036	20	+ 17	− 187
Arc lamps and searchlights ...	456	− 75	+ 281	122	+ 77	+ 80	—	− 14	—
Incandescent lamps	37,454	+ 7,043	+ 9,301	15,595	+ 1,793	+ 8,729	1,310	+ 816	+ 984
Other lighting apparatus ...	22,107	+ 1,455	− 3,008	23,692	+ 1,733	+ 10,064	3,948	+ 651	+ 3,000
Batteries and accumulators ...	55,354	+ 5,039	+ 12,992	1,742	+ 177	− 1,387	116	+ 81	+ 11
Meters and instruments ...	22,000	− 1,009	− 2,144	17,827	− 1,874	− 3,552	187	− 72	− 177
Unenumerated electrical goods and apparatus	98,500	+ 14,443	+ 21,674	33,604	+ 3,981	− 2,990	3,034	+ 1,142	− 1,732
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)...	23,603	+ 9,290	+ 9,949	69	− 132	− 13	—	—	—
Submarine telegraph and telephone cables...	29,325	+ 29,238	+ 29,325	—	—	—	—	—	—
Telegraph and telephone apparatus	198,207	+ 79,008	+ 59,580	31,276	+ 1,592	− 6,396	2,041	+ 1,287	− 10
Electrical Machinery—									
Railway and tramway motors	2,945	− 550	− 11,135	—	—	—	—	—	—
Other motors and generators	121,539	+ 7,533	+ 14,407	—	—	—	—	—	—
Unenumerated electrical machinery	92,899	− 39,965	− 113,146	20,985	− 2,263	− 12,591	1,501	+ 1	− 3,546
Total	£804,121	+ £115,158	+ £26,092	£173,129	+ £6,969	+ £2,780	£12,276	+ £4,001	− £1,551
Decrease for the first five months of the year... ...	Exports. £230 631			Imports. £275,254			Re-exports. £41,566		

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Airdrie.—Public Assistance offices; architect, County Council Office, Hamilton.

Bellshill (LANARKSHIRE).—Houses (92); county architect, Hamilton.

Bembridge (I.O.W.).—Methodist church (£3,700); Weaver Bros., builders.

Birmingham.—Offices and extensions to buildings for A. D. Wimbush & Son, Ltd., Little Green Lane, Small Heath, with electrical installations (£8,500); C. Bryant & Son, Ltd., builders, 65, Whitmore Road, Small Heath.

Blackpool.—Houses (37), Lyddesdale Avenue; Chadwick & Co.

Bonnybridge.—Houses (20); T. M. Copland & Blakey, architects, Falkirk.

Bootle.—Houses (83), Aintree Road and Southport Road (electrical installations); E. Spencer, builder, 37, Hale Road, Walton.

Bourne End (BUCKS).—Cinema and shops; E. L. de la Rue, High Street, Cookham.

Brampton. — Maternity ward for the Cottage Hospital; S. W. B. Jack, architect, Lloyds Bank Chambers, Carlisle.

Brighton.—Office building, Marlborough Road (electrical installation); James Barnes & Son, builders, Old Shoreham Road, Hove.

Burton-on-Trent.—Casual ward extensions (£7,000); borough surveyor.

Bury (LANCS).—Confectionery works, Pimhole (£50,000), for Meadowcroft & Co., Ltd.

Carlisle.—Houses (28); P. Dalton, city engineer, Fisher Street. Extensions, Cumberland Infirmary; S. W. B. Jack, architect.

Caterham.—Houses (20), Salmons Lane; W. J. Burstow.

Chard.—Houses (24); borough surveyor.

Chatham.—Public baths (£35,000); borough surveyor.

Cheltenham.—Houses (81); borough surveyor.

Chesterfield.—Houses (134); borough engineer.

Colchester.—Business stores, Wimpole Road, for the Co-operative Society; secretary.

Congleton (CHESHIRE).—Factory for R. H. Lowe & Co., Ltd.

Consett (DURHAM).—Houses (20); T. Hutton, surveyor.

Craghead (DURHAM).—Church; I. Bulmer, secretary, 21, Rose Avenue, South Moor.

Dartford.—Houses (26), Collingwood Close; W. G. Cooper.

Dover.—Houses (£30,040); Lewis & Sons, builders.

Durham.—Houses (250); R.D.C. clerk.

Faversham.—Business stores, Preston Street, for the Co-operative Society; H. Baldwin, secretary.

Fraserburgh.—Houses (64); burgh surveyor.

Glasgow.—Hotel, Queen Street (electrical installation); Jn. Emery & Sons, builders, Jessie Street, Glasgow.

Gosforth (NORTHUMBERLAND).—Houses (336), east side of the Great North Road, for W. E. Hall & Sons, builders, 32, Mosley Street, Newcastle.

Grangemouth.—Extensions to refinery for Scottish Oils, Ltd. (£3,190); manager.

Halesowen.—Houses (24), Two Gates Lane; U.D.C. surveyor.

Halstead (ESSEX).—Houses (20), King's Head Estate; W. A. Nicholson, U.D.C. surveyor.

Herne Bay.—Business stores, High Street, for Canterbury Co-operative Society; L. G. Ekins, architect.

Horbury.—Houses, Sunroyd Hill (56) and Dudfleet Lane (108); W. Sugars, borough engineer, Town Hall.

Hull.—Offices, The Avenue, High Street, for Spillers, Ltd. (electrical installations); Quibell & Son, Ltd., builders, 354, Beverley Road.

Ilkeston.—Houses (31), Norman Street; R. M. Tickle. Bakery, Derby Road; Co-operative Society.

Invergarry.—R.C. church; Rev. Father C. Deickhoff, Fort-Augustus.

Ipswich.—Houses (50), Gainsborough Estate (£14,248); Bennett Bros., Letchworth.

Irish Free State.—(CLONMEL, Co. TIPPERARY).—Houses (32), Irishtown; J. T. Walsh, architect, Town Hall.

Irvine (AYRSHIRE).—Houses (200); burgh surveyor.

Kidderminster.—Houses (26), Birmingham Road; E. Leach & Co.

Lanarkshire.—Boiler house, &c. (electrical work), Birkwood Institution, for the Mental Hospitals Joint Committee; clerk, 191, Ingram Street, Glasgow.

Lanchester.—Houses (175); R.D.C. surveyor.

London.—(CAMBERWELL).—Extensions, Maudesley Mental Hospital (£47,634); L.C.C. architect. (EALING).—Houses (21), Russell Road and Clauson Avenue; Gradwell & Co., Ltd., Farnham Road, Slough. Houses (22), Cleveland Road; R. Lancaster and Sons, 30, Ealing Road, Wembley. Block of flats, Hastings Road; Housing Corporation of Great Britain, Ltd. School (400 places), West Greenford; borough engineer. (HACKNEY).—Factory for Oxo, Ltd., Waterden Road; Wallis, Gilbert & Partners, architects. Tenements (200), Lower Clapton Road (£81,500); borough engineer. (HAMPSTEAD).—Two blocks of flats, Lower Cross Road; H. V. Milnes Emerson. (PUTNEY).—Hospital extensions (£25,000), for the governors; secretary, Lower Common. (PADDINGTON).—Hospital extensions (£4,129); F. D. Hidden & Co., Ltd., Brentford. (STEPNEY).—Tenements, Limehouse Fields (£8,237); borough engineer. (WESTMINSTER).—Sports stadium (£600,000), Page Street and Marsham Street, for Jeff Dickson; Sir Frank Baines, architect.

Lydney.—Wireless factory, Underdean, for G. Dunlop.

Machynlleth (MONT).—Hospital (£7,000); secretary.

March.—Houses (24), Robingoodfellow's Lane, for City and Borough Housing Corporation, Ltd.

Macclesfield.—Bank premises, Market Place, for the Union Bank of Manchester; H. Quentery Farmer, chartered architect, 102, Brock Street.

Middlesbrough.—Elementary school, Whinney Banks Estate; borough engineer.

Milnrow.—Houses (50) for U.D.C.; Thomas Wilkinson & Son (Rochdale), Ltd., builders.

Monkseaton (NORTHUMBERLAND).—Houses, West Monkseaton; S. J. Stephenson, architect, 2, Saville Place, Newcastle-on-Tyne.

Morpeth (NORTHUMBERLAND).—Houses (24), Wellwood Gardens; R. Carse, builders, High Street, Amble.

Motherwell.—Houses (£210,000); burgh surveyor.

Newcastle-on-Tyne.—Cinema, Haymarket, for Dixon Scott; Dixon & Bell, architects, Pearl Buildings. Extensions, Babies' Hospital and Mothercraft Centre; Hill & Honeyman, architects, 6, Eldon Square.

Northallerton (YORKS).—Houses (12), West View Terrace; T. Willoughby, builder. R.C. church and presbytery; F. Spinks, builder, Fairfield Road, Bridlington.

North Riding.—Extensions, female nurses' home, Clifton, Yorks, for the Mental Hospital Visiting Committee; clerk of works.

Oxford.—Houses (22), Crocket Road; A. G. Simmons.

Penrith.—Cinema, Old London Road; G. H. Fawcett, architect.

Peterhead.—Extension, Academy (£1,885); architect, County Council Offices, Aberdeen.

Portsmouth.—Cinema, London Road; Broadway Co. Elementary school, Farlington, for E.C. Extensions, Royal Hospital (£15,461); Frank Bevis, Ltd., builders.

Reading.—Houses (440), Kentwood Estate; Frank Scrivener and Co. Houses (20), for the Hayes Bridge Estate, Ltd.

Richmond (SURREY).—Houses, Ham Estate (58) and Windham Road Estate (16); borough surveyor.

Romsey.—Public offices, with electrical and heating work (£5,000); Mr. Yorke, R.D.C. architect.

Rotherham.—Church, Lord Street and Cambridge Street, for the trustees (electrical installation); Beedon's, Ltd., builders, Thrybergh.

Royston.—Casual wards (£3,540); John Ray, Ltd., Letchworth.

Ryde.—Town hall (£20,000); B. F. Holness, borough surveyor.

Ryhope (CO. DURHAM).—Alterations to Grand Theatre; Ranken, Ltd., builders, Stockton Road, Sunderland.

Shrewsbury.—Cinema, Castle Gates (electrical installation); A. Williams, architect, Kenneth Chambers, Dogpool.

Shropshire.—School, Alveley; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Southall.—Houses (33), Lady Margaret Road; Property Development & Construction Co. Hospital, Osterley Park Road; Hospital Committee.

Southend-on-Sea.—Promenade pier, with club premises, restaurant, &c., Westcliff (£100,000); Gaunt, Foster & Hill, solicitors, 122, Charing Cross Road, London, W.C.

South Shields.—Houses (22), Cranford Street; J. T. Armstrong and Son. Houses (36), Sunniside Estate, for the Sutton Dwelling Trust; Kettlewell Sons, Ltd., builders, Colonial Street, Hull.

Stanley (DURHAM).—Cinema, Front Street; T. Rawes, Palace Theatre, Durham.

Stornoway.—Infectious diseases hospital (£4,000), for Ross and Cromarty; T. S. H. Burns, clerk, Dingwall.

Stretford.—Houses (290), Barton Road; J. Maunders & Sons. Houses (68), Derbyshire Lane; E. & J. Slater. Houses, Kings Road (28) and Milton Road (98); Sparke & Stephens, Ltd. Houses (23), Low Moss Lane; R. P. Wheeler. Houses (30), Tresco Avenue; Littler & Rich. Works extensions, Talbot Road; Crittall Manufacturing Co.

Surrey.—Schools, Stoneleigh Estate, Epsom (£10,300), Cheam (£31,831), for County E.C.; W. W. Finny, secretary, Kingston-on-Thames.

Swanscombe (KENT).—Four shops and houses, Milton Road; L. F. L. Bridgland.

Swansea.—Houses (664), Townhill Estate; borough engineer. Reconstruction of premises, Waterloo Street; Messrs. Chidzoy.

Tanfield.—Houses (50), Reservoir site (£16,000); U.D.C. surveyor.

Torquay.—Wing, Palace Hotel; Vanstone & Sons.

Tynemouth.—Municipal offices (£130,000); J. L. Beckett, architect, Howard Street, North Shields.

Uttoxeter.—Houses (125); S. S. Proud, U.D.C. surveyor.

Wakefield.—Houses (20), Ings Road; housing architect.

Wearmouth Colliery.—Miners' Welfare Institute (£2,600); Randle & Co., builders, Dunelm Street, Sunderland.

West Hartlepool.—Saw mills, for William Brown Sawmills, Ltd., Oxford Street (£12,000).

West Riding.—School extensions, Conisborough (£10,000); director of education, Wakefield.

Willington (DURHAM).—Houses (24); J. H. Gardner, U.D.C. surveyor.

Wokingham.—Houses (36); R.D.C. surveyor.

Wolverhampton.—Houses (56), Rooker Road; Wolverhampton and Dudley Breweries, Ltd. Houses (46), Elston Hall Lane; A. J. Fieldhouse. Estate development, Warstones Road; A. M. Griffiths & Son, Ltd.

Workington.—Houses (46), rehousing estate; borough engineer.

Worthing.—Estate development, Goring Hill, for Duncan E. Gray & Partners, 129, Mount Street, London, W. Houses (36), Sheridan Road and Goldsmith Road; S. Wilmore Phillips & Co., builders, 26, Chapel Road.

Wrexham.—Houses, Spring Lodge Estate; builders, Lloyd and Cross, Ltd., Birkenhead (50), and Alun Edward, Ltd., Cefnybedd (50).

York.—Alterations and improvements to premises of Leak and Thorpe, Ltd., Coney Street.